EIC SEARCH RESULTS

Serial No.10/717,379 – Fenestrated bone tap and method

Searcher: Ethel Leslie
Date: June 9 & 10, 2009

Inventor Search

Search Strategy

```
Set     Items   Description
S1        373   AU=(FRANKEL B? OR FRANKEL, B?)
S2          6   AU=(KOYSH S? OR KOYSH, S?)
S3          2   S1 AND S2
S4          4   S2 NOT S3
S5          9   S1 AND ((BONE? OR SPINE? ? OR SPINAL? OR VERTEBRA? OR INTE-
              RVERTEBR? OR INTRAVERTEBR?) (10N) (TAP OR TAPS OR TAPP??? OR -
              DRILL? OR MILL???))
S6          7   S5 NOT S3:S4
S7          3   RD  (unique items)

File 350:Derwent WPIX 1963-2009/UD=200935
         (c) 2009 Thomson Reuters
File 347:JAPIO Dec 1976-2009/Jan(Updated 090503)
         (c) 2009 JPO & JAPIO
File 155:MEDLINE(R) 1950-2009/Jun 05
         (c) format only 2009 Dialog
File  73:EMBASE 1974-2009/Jun 05
         (c) 2009 Elsevier B.V.
File   5:Biosis Previews(R) 1926-2009/May W5
         (c) 2009 The Thomson Corporation
File  24:CSA Life Sciences Abstracts 1966-2009/Jul
         (c) 2009 CSA.
File   8:Ei Compendex(R) 1884-2009/May W5
         (c) 2009 Elsevier Eng.  Info. Inc.
File  35:Dissertation Abs Online 1861-2009/May
         (c) 2009 ProQuest Info&Learning
File  65:Inside Conferences 1993-2009/Jun 09
         (c) 2009 BLDSC all rts. reserv.
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Search Results

3/25/1 (Item 1 from file: 350)
DIALOG(R)File 350: Derwent WPIX
(c) 2009 Thomson Reuters. All rights reserved.

0017167354 *Drawing available*
WPI Acc no: 2007-882308/200781
Related WPI Acc No: 2005-346063
XRPX Acc No: N2007-700839
Fluid e.g. bone marrow, aspirating method for use during vertebroplasty, involves advancing bone tap into bone e.g. femur, aspirating fluid from bone through bone tap, and

introducing bone fastener into opening formed by bone tap
Patent Assignee: FRANKEL B M (FRAN-I); HUNTER N S (HUNT-I); KOYSH S D (KOYS-I)
Inventor: **FRANKEL B M**; HUNTER N S; **KOYSH S D**

Patent Family (1 patents, 1 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
US 20070276402	A1	20071129	200781	B

Local Applications (no., kind, date): US 2003717379 A 20031119; US 2006616714 A 20061227
Priority Applications (no., kind, date): US 2003717379 A 20031119; US 2006616714 A 20061227

Alerting Abstract US A1
NOVELTY - The method involves attaching a driver to a **bone tap** (100) and **placing** the **bone tap** at an initial **opening form**ed in the **bone** e.g. femur. The **bone tap** is rotated to thread the **bone tap** into the **bone**. The **bone tap** is advanced into the **bone**, and a **fluid** e.g. **bone** marrow, from the **bone** is aspirated through the **bone tap**. A **fluid** retrieval system is coupled to the **bone tap**, and the **fluid** retrieval system is activated to move **fluid** from the **bone**. The driver is used to remove the **bone tap** from the **bone**. A **bone fastene**r e.g. **bone screw**, is **introduce**d into an **opening form**ed by the **bone tap**.
USE - Used during **vertebr**oplasty, **spinal** arth**rode**sis, open surgical procedure, closed minimally invasive technique such as percutaneous transforaminal lumbar interbody fusion (TLIF), posterior lumbar interbody fusion (PLIF), and/or pedicle **screw** procedure, for aspirating a **fluid** e.g. **bone** marrow, antibacterial agent, chemotherapy agent, synthetic **bone** material and **bone** growth protein, from a human **bone** e.g. **vertebr**a, sacrum, femur, tibia, radius, and/or humerus, for treating **bone** tumor and damaged or diseased **bone**.
ADVANTAGE - The **bone tap** is advanced into the **bone** e.g. femur, and the **fluid** e.g. **bone** marrow, from the **bone** is aspirated through the **bone tap**, thus effectively aspirating **fluid** from the **bone**, and/or **reduc**ing a risk of complications such as retrograde flowback of **bone** cement, and fever.
DESCRIPTION OF DRAWINGS - The drawing shows a perspective view of a **bone tap**.
100 **Bone tap**
102 Shaft
104 Threading
106 Flutes
108 Tool portion
110 Indicia
112 Passage
114 Fenestrations

3/25/2 (Item 2 from file: 350)
DIALOG(R)File 350: Derwent WPIX *** current application ***

0014998175 *Drawing available*
WPI Acc no: 2005-346063/200535
Related WPI Acc No: 2007-882308
XRPX Acc No: N2005-282902
Bone tap for introducing fluid into e.g. human bone, has multiple openings formed through threading in communication with passage formed in portion of body
Patent Assignee: ABBOTT LAB (ABBO); FRANKEL B M (FRAN-I); KOYSH S D (KOYS-I)
Inventor: **FRANKEL B M**; **KOYSH S D**; **FRANKEL B**; **KOYSH S**

Patent Family (5 patents, 106 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
US 20050107800	A1	20050519	200535	B
WO 2005051208	A1	20050609	200538	E
EP 1684644	A1	20060802	200650	E
AU 2004292408	A1	20050609	200680	E
JP 2007511324	W	20070510	200731	E

Local Applications (no., kind, date): US 2003717379 A 20031119; WO 2004US36895 A 20041104; EP 2004800786 A 20041104; WO 2004US36895 A 20041104; AU 2004292408 A 20041104; WO 2004US36895 A 20041104; JP 2006541227 A 20041104
Priority Applications (no., kind, date): US 2003717379 A 20031119

Alerting Abstract US A1
NOVELTY - The **bone tap** (100) has a body **form**ed at a portion with a passage, and a threading (104) located near the end of the body. Multiple **opening**s are **form**ed through the threading in communication with the passage.
DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

a. a system for **form**ing a threaded **hole** in **bone**; and
b. a method of **introduc**ing **fluid** into **bone**.

USE - For **introduc**ing **fluid** into e.g. human **bone**.
ADVANTAGE - Enables to **introduce fluid** into a patient using minimally invasive procedures.
DESCRIPTION OF DRAWINGS - The figure shows the front view of the **bone tap**.
100 **Bone tap**
102 Shaft
104 Threading
110 Indicia

4/25/1 (Item 1 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0016744431 *Drawing available*
WPI Acc no: 2007-459501/200744
XRPX Acc No: N2007-348291
Surgical port of dilation system for bodily tissue of patient, comprises radiopaque marker ring provided at distal region of tubular structure having working channel
Patent Assignee: ABBOTT LAB (ABBO); JONES R J (JONE-I); KOYSH S (KOYS-I)
Inventor: JONES R J; **KOYSH S**

Patent Family (2 patents, 116 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
WO 2007070625	A2	20070621	200744	B
US 20070142855	A1	20070621	200744	E

Local Applications (no., kind, date): WO 2006US47671 A 20061214; US 2005303349 A 20051216
Priority Applications (no., kind, date): US 2005303349 A 20051216

Alerting Abstract WO A2

NOVELTY - The surgical port (20) consists of a tubular structure (30) having a working channel (31). A collar (40) is provided at a proximal region (32) of the tubular structure and a connection is extended from the collar. A radiopaque marker ring (50) **made** of stainless steel, iridium, platinum, tungsten, gold, barium and tantalum is provided at a distal region (34) of the tubular structure, by engaging with a groove **form**ed at the distal region of tubular structure.
DESCRIPTION - An INDEPENDENT CLAIM is included for method for dilating bodily tissue of patient.
USE - For dilation system (claimed) used for establishing working channel through bodily tissue of patient.
ADVANTAGE - Enables a physician to properly and accurately **insert** the surgical port through the bodily tissue to the surgical site.
DESCRIPTION OF DRAWINGS - The figure shows an exploded view of surgical port.
20 Surgical port
30 Tubular structure
31 Working channel
32 Proximal region
34 Distal region
40 Collar
50 Radiopaque marker ring

4/25/2 (Item 2 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0012418212 *Drawing available*
WPI Acc no: 2002-362652/200239
XRPX Acc No: N2002-283408
Transverse connector with cam operated fastening systems for attaching to elongated members of an orthopedic stabilization system
Patent Assignee: **SPINAL** CONCEPTS INC (**SPIN**-N); ABBOTT **SPINE** INC (ABBO-N)
Inventor: JONES R J; **KOYSH S D**; MCBRIDE G G

Patent Family (7 patents, 95 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
WO 2002030307	A2	20020418	200239	B
AU 200211408	A	20020422	200254	E
US 6872208	B1	20050329	200522	E
US 6887241	B1	20050503	200530	E
AU 2002211408	A8	20050915	200569	E
US 7485132	B1	20090203	200915	E
US 20090138047	A1	20090528	200935	E

Local Applications (no., kind, date): WO 2001US31016 A 20011003; AU 200211408 A 20011003; US 2000684218 A 20001006; US 2000680756 A 20001006; AU 2002211408 A 20011003; US 2000684628 A 20001006; US 2000684628 A 20001006; US 2009364238 A 20090202
Priority Applications (no., kind, date): US 2000680756 A 20001006; US 2000684218 A 20001006; US 2000684628 A 20001006; US 2009364238 A 20090202

Alerting Abstract WO A2
NOVELTY - A transverse connector (30) comprises a body (38) provided with a pair of **opening**s (40) with cam systems (42) configured to couple the connector to elongated members of an orthopedic stabilization system. A first section (46) is connected to a second section (48) via a shaft (108) and secured by a **fasten**er (106) to enable the distance between the **opening**s to be adjusted. The device may be **made** from titanium or titanium alloy, stainless steel or ceramic. Alternative embodiments

permit the two sections to be angled or rotated with respect to each other. Also disclosed are tools used for adjusting and fixing the connector in **place**.
USE - For connecting adjacent **rod**s of an orthopedic stabilization system.
ADVANTAGE - The device may be supplied as a unitary unit having a thin, low profile and may be secured in **place** without threaded **fasten**ers.
DESCRIPTION OF DRAWINGS - The drawing shows a perspective view of an adjustable connector having three degrees of freedom.
30 Connector
38 Body
40 **Opening**s
42 Cam systems
46 First section
48 Second section
106 **Fasten**er
108 Shaft.

4/7/3 (Item 1 from file: 5)
DIALOG(R)File 5: Biosis Previews(R)

18797520 **Biosis No.:** 200600142915
Adjustable transverse connector

Author: McBride G Grady; Jones Robert J; **Koysh Scott D**
Author Address: Winter Pk, FL USA* * USA
Journal: Official Gazette of the United States Patent and Trademark Office Patents MAR 29 2005 2005
Patent Number: US 06872208 **Patent Date Granted:** March 29, 2005 20050329 **Patent Classification:** 606-61 **Patent Assignee: Spinal** Concepts, Inc. **Patent Country:** USA
ISSN: 0098-1133
Document Type: Patent
Record Type: Abstract
Language: English

Abstract: A transverse connector may be attached to **rod**s of an orthopedic stabilization system. The **rod**s of the stabilization system may be non-parallel and skewed in orientation relative to each other. The transverse connector may include two members that are joined together by a **fasten**er. The transverse connector may be adjustable in three separate ways to allow the transverse connector to attach to the **rod**s. The length of the transverse connector may be adjustable. The **rod opening**s of the transverse connector may be partially rotatable about a longitudinal axis of the transverse connector. Also, a first member may be angled towards a second member so that the transverse connector can be attached to **rod**s that are diverging. The transverse connector may include cam locks that securely attach the transverse connector to the **rod**s. Rotating a cam locks may extend a **rod** engager into a **rod opening**. The **rod** engager may be a portion of the cam lock. The extension of the **rod** engager into a **rod opening** may push a **rod** against a body of the transverse connector to **form** a frictional engagement between the transverse connector, the **rod**, and the **rod** engager.

4/7/4 (Item 2 from file: 5)
DIALOG(R)File 5: Biosis Previews(R)

18796796 **Biosis No.:** 200600142191
Adjustable transverse connector with cam activated engagers

Author: McBride G Grady; Jones Robert J; **Koysh Scott D**

Author Address: Winter Pk, FL USA* * USA
Journal: Official Gazette of the United States Patent and Trademark Office Patents MAY 3 2005 2005
Patent Number: US 06887241 **Patent Date Granted:** May 03, 2005 20050503 **Patent Classification:** 606-61 **Patent Assignee: Spinal** Concepts, Inc. **Patent Country:** USA
ISSN: 0098-1133
Document Type: Patent
Record Type: Abstract
Language: English

Abstract: A transverse connector may be attached to **rod**s of an orthopedic stabilization system. The **rod**s of the stabilization system may be non-parallel and skewed in orientation relative to each other. The transverse connector may include two members that are joined together by a **fasten**er. The transverse connector may be adjustable in three separate ways to allow the transverse connector to attach to the **rod**s. The length of the transverse connector may be adjustable. The **rod openings** of the transverse connector may be partially rotatable about a longitudinal axis of the transverse connector. Also, a first member may be angled towards a second member so that the transverse connector can be attached to **rod**s that are diverging. The transverse connector may include cam locks that securely attach the transverse connector to the **rod**s. Rotating a cam locks may extend a **rod** engager into a **rod opening**. The **rod** engager may be a portion of the cam lock. The extension of the **rod** engager into a **rod opening** may push a **rod** against a body of the transverse connector to **form** a frictional engagement between the transverse connector, the **rod**, and the **rod** engager.

7/7/1 (Item 1 from file: 155)
DIALOG(R)File 155: MEDLINE(R)

18123469 **PMID:** 17905320
Percutaneous vertebral augmentation: an elevation in adjacent-level fracture risk in kyphoplasty as compared with vertebroplasty.

Frankel Bruce M; Monroe Timothy; Wang Chiang
Department of Neurosurgery, Medical University of South Carolina, 96 Jonathan Lucas Street, Suite 428 CSB, Charleston, SC 29425, USA. frankel@musc.edu
spine journal - official journal of the North American **Spine** Society (United States) Sep-Oct 2007 , 7 (5) p575-82 , **ISSN:** 1529-9430--Print **Journal Code:** 101130732
Publishing Model Print-Electronic
Document type: Comparative Study; Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
BACKGROUND CONTEXT: Osteoporotic **vertebr**al compression fractures (VCFs) are being increasingly treated with minimally invasive **bone** augmentation techniques such as kyphoplasty and **vertebr**oplasty. Both are reported to be an effective means of pain relief; however, there may be an increased risk of develo**ping** subsequent VCFs after such procedures. PURPOSE: The purpose of this study was to compare the effectiveness and complication profile of kyphoplasty and **vertebr**oplasty in a single patient series. STUDY DESIGN/SETTING: A clinical series of 36 patients with VCFs treated by **vertebr**al augmentation procedures was retrospectively analyzed for surgical approach, volume of cement injected, cement extravasation (symptomatic and asymptomatic), the occurrence of subsequent adjacent level fracture, and pain relief. PATIENT SAMPLE: Thirty-six patients with 46 VCFs underwent either kyphoplasty or **vertebr**oplasty after failing conservative therapy. The mean patient age was not significantly different between the kyphoplasty group (70; range, 46-83) and **vertebr**oplasty group (72; range, 38-90) (p=.438). OUTCOME MEASURES: Outcomes were assessed by using self-report measures (a comparative pain rating scale) and physiologic measures (pre- and postoperative radiographs). METHODS: Thirty-six patients with VCFs underwent 46 augmentation procedures (17 patients had 20 fractures treated via kyphoplasty, and 19 patients had 26 fractures treated via **vertebr**oplasty). Seventeen patients in this series underwent kyphoplasty using standard techniques involving **bone** void **creat**ion with balloon tamps, followed by cement injection. Nineteen

patients underwent a percutaneous **vertebr**oplasty procedure using a novel cannulated, fenestrated **bone tap** developed to direct cement anteriorly into the **vertebral** body to avoid backflow of cement onto neural elements. RESULTS: Pain improvement was seen in >90% of patients in both groups. Mean cement injection per **vertebr**al body was 4.65 mL and 3.78 mL for the kyphoplasty and **vertebr**oplasty groups, respectively (p=.014). Ninety-five percent of the kyphoplasty procedures were perform**e**d bilaterally, whereas only 19% of the **vertebr**oplasty procedures required bilateral augmentation (p<.001). There was no cement extravasation resulting in radiculopathy, or myelopathy in either group. Asymptomatic cement extravasation was seen in 5 of 46 (11%) of the total series (3/20 [15%] and 2/26 [7.7%] of kyphoplasty and **vertebr**oplasty, respectively) (p=.696). Within a 3-month period, there were 5 new adjacent level fractures seen in 3 patients who underwent a kyphoplasty procedure (5/20 [25%]) and none in the **vertebr**oplasty group (p<.05). CONCLUSIONS: **Vertebr**oplasty appears to offer a comparable rate of postoperative pain relief as kyphoplasty while using less **bone** cement more often via a unilateral approach and without the attendant risk of adjacent level fracture.
Record Date Created: 20071001
Record Date Completed: 20080104
Date of Electronic Publication: 20070124

7/7/2 (Item 2 from file: 155)
DIALOG(R)File 155: MEDLINE(R)

18104435 **PMID:** 17881965
Segmental polymethylmethacrylate-augmented pedicle screw fixation in patients with bone softening caused by osteoporosis and metastatic tumor involvement: a clinical evaluation.

Frankel Bruce M; Jones Tanya; Wang Chiang
Department of Neurosurgery, Medical University of South Carolina, Charleston, South Carolina 29425, USA. frankel@musc.edu
Neurosurgery (United States) Sep 2007 , 61 (3) p531-7; discussion 537-8 , **ISSN:** 1524-4040--Electronic **Journal Code:** 7802914
Publishing Model Print
Document type: Comparative Study; Evaluation Studies; Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
OBJECTIVE: Instrumentation of the osteoporotic **spine** may result in **bone** failure because of pedicle **screw** loosening and pullout. A clinical evaluation of a novel fenestrated **bone tap** used in pedicle **screw** augmentation was perform**e**d to determine the perform**a**nce and safety of this technique. METHODS: Over a 2.5-year period, the clinical and radiographic results of 119 consecutive patients who underwent instrumented arth**rod**esis were reviewed. Of these patients, 23 had **bone** softening secondary to osteoporosis and/or metastatic **spinal** tumor involvement. These patients underwent surgical decompression and **spinal** instrumentation. RESULTS: Six patients (26%) had metastatic **spine** disease (squamous cell lung carcinoma, renal cell carcinoma, bladder carcinoma, breast, prostate, and uterine adenocarcinoma); five patients (22%) had a degenerative spondylolisthesis; and 12 patients (52%) had burst fractures, eight as a result of benign causes and four as a result of metastatic disease. Four (17%) patients underwent revision surgery of **previous** pedicle **screw** failure resulting from **bone** softening and pseudarthrosis. A total of 98 levels were fused using 158 polymethylmethacrylate-augmented **screw**s. None of the patients experienced operative death, myocardial infarction, hypoxemia, intraoperative hypotension, radiculopathy, or myelopathy. Asymptomatic anterior cement extravasation was observed in nine patients (39%). There was one asymptomatic polymethylmethacrylate pulmonary embolus and one wound infection. There was no significant relationship between cement extravasation and the quantity used, levels augmented, or location (P > 0.05). There were no construct failures. CONCLUSION: Polymethylmethacrylate-augmented pedicle **screw** fixation **reduce**s the likelihood of pedicle **screw** loosening and pullout in patients with osteoporosis requiring instrumented arth**rod**esis.
Record Date Created: 20070920

Record Date Completed: 20071107

7/7/3 (Item 3 from file: 155)
DIALOG(R)File 155: MEDLINE(R)

17985106 **PMID:** 17633487
A biomechanical cadaveric analysis of polymethylmethacrylate-augmented pedicle screw fixation.

Frankel Bruce M; D'Agostino Sabino; Wang Chiang
Department of Neurosurgery, Medical University of South Carolina, Charleston, South Carolina 29425, USA. frankel@musc.edu
Journal of neurosurgery. **Spine** (United States) Jul 2007 , 7 (1) p47-53 , **ISSN:** 1547-5654--Print **Journal Code:** 101223545
Publishing Model Print
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
OBJECT: Instrumentation of the osteoporotic **spine** can be fraught with complications such as hardware failure. A cadaver study was per**form**ed to determine the biomechanical per**form**ance of polymethylmethacrylate (PMMA)-augmented pedicle **screw**s. METHODS: Three osteoporotic human cadaveric specimens with a mean **bone** mineral density of 0.70 g/cm2 were used to evaluate the per**form**ance of a novel fenestrated **bone tap** in pedicle **screw** augmentation. On this device, **tap** threads serve a dual purpose in preventing backflow of cement toward neural elements while allowing for a custom **form** for subsequent **screw place**ment. The **tap** was used to inject a mean volume of 3.7 ml PMMA/pedicle (range 2-8.0 ml PMMA/pedicle) followed by pedicle **screw place**ment between L-5 and T-5, alternating between augmented and nonaugmented instrumentation. Axial pullout testing was then per**form**ed. RESULTS: Pedicle **screw** pullout strength was increased in both primary and salvage procedures by 119% (p = 0.001) and 162% (p = 0.01), respectively, after PMMA augmentation. Additionally, the injected cement volumes were divided into two groups, a low-cement group (< or = 2.8 ml/pedicle) and a high-cement group (> or = 5.5 ml/pedicle). Interestingly, the pullout strength did not significantly change with increased cement usage between the two groups (p > 0.05 for all comparisons). CONCLUSIONS: Polymethylmethacrylate-augmented pedicle **screw** fixation results in a significant increase in the axial pullout strength of augmented pedicle **screw**s in both primary and revision procedures. This technique may be a valuable adjunct in cases in which bolstering of the **screw-bone** interface is necessary.
Record Date Created: 20070718
Record Date Completed: 20070731

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Foreign & International Patent Search #1

Search Strategy

```
Set     Items   Description
S1     143330   BONE? ? OR VERTEBRAE? OR VERTEBRA OR VERTEBRAL? OR INTERVE-
             RTEBR? OR INTRAVERTEBR? OR SPINE? ? OR SPINAL?
S2       1780   (DRILL? OR CREATE? OR CREATING OR CREATION OR TAP OR TAPS -
             OR TAPP??? OR BORING) (5N) (HOLE OR HOLES OR BORE? ?)
S3       1343   (COOL??? OR FLUSH? OR CHILL? OR (REDUC? OR DECREAS? OR LOW-
             ER?) (2N) (TEMP OR TEMPS OR TEMPERATURE?)) (5N) (FLUID? OR LI-
             QUID? OR WATER OR SALINE OR H2O OR RINGERS OR COOLANT? OR MED-
             IA OR MEDIUM)
S4       7964   (INSERT? OR PLACE? OR PLACING OR REPLAC? OR POSITION? OR I-
             NTRODUC? OR DELIVER? OR PUT OR PUTS OR PUTTING) (5N) (FASTENE-
             R? OR SCREW? ? OR NAIL? ? OR ROD OR RODS OR ANCHOR? ? OR PIN -
             OR PINS)
S5          2   S2(S)S3(S)S4
S6          6   S2 AND S3 AND S4
S7          4   S6 NOT S5
S8       5502   S1 (5N) (HOLE OR HOLES OR BORE? ? OR BORING? OR DRILL??? OR
              TAP OR TAPS OR TAPP???)
S9          2   S8 (S) S3(S)S4
S10         1   S9 NOT (S5 OR S7)
S11         5   S8 AND S3 AND S4
S12         0   S11 NOT (S5 OR S7 OR S10)


File 350:Derwent WPIX 1963-2009/UD=200935
         (c) 2009 Thomson Reuters
File 347:JAPIO Dec 1976-2009/Jan(Updated 090503)
         (c) 2009 JPO & JAPIO
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Search Results

5/25,K/1 (Item 1 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0010915271 *Drawing available*
WPI Acc no: 2001-536676/200159
XRPX Acc No: N2001-398579
Dental guide post system involves cutting a bore and locating post within and enlarging using tubular cutter
Patent Assignee: KURER H G (KURE-I)
Inventor: KURER H G

Patent Family (5 patents, 93 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
WO 2001064125	A1	20010907	200159	B
AU 200135780	A	20010912	200204	E
EP 1278475	A1	20030129	200310	E
US 20030170591	A1	20030911	200367	E
US 6923650	B2	20050802	200550	E

Local Applications (no., kind, date): WO 2001GB831 A 20010227; AU 200135780 A 20010227; EP 2001907913 A 20010227; WO 2001GB831 A 20010227; WO 2001GB831 A 20010227; US 2002220532 A 20021107; WO 2001GB831 A 20010227; US 2002220532 A 20021107
Priority Applications (no., kind, date): GB 20004636 A 20000229; GB 200029818 A 20001207

Alerting Abstract WO A1
NOVELTY - The method comprises of cutting a **pilot bore** in the **bone** tissue with a reamer, locating a **guide** post (7) in the **bore** and **form**ing a enlarged region around the **pilot bore** with a tubular cutter (10) located co-axially around and in contact with the **guide** post. The **guide** post is located in the **pilot bore** such that the upper end portion of the **guide** post projects upwardly.
DESCRIPTION - A INDEPENDENT claim is disclosed for **guide** post.
USE - In cutting **bore**s in dental, oral or orthopedic surgery to support and secure a crown post.
ADVANTAGE - Achieves a secure location of a **pin** or post in acute **bore**.
DESCRIPTION OF DRAWINGS - The drawing shows the diagrammatic cross-section of the cut **bore**.
7 **Guide** post
10 Tubular cutter.

Original Abstracts:cut even with a hand **drill** due to the guidance provided by the post. The cutter may have **hole**s (**15**) or channels for circulation of **cooling**/lubricating **liquid**, and a swarf-removing slot (**13**) may be provided. When the technique is used in dentistry **for replace**ment **of** a tooth crown, a tubular support element (**29**a) is fixed around the post in the **bore** enlargement...

7/25,K/1 (Item 1 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0010434030 *Drawing available*
WPI Acc no: 2001-032893/200105
XRPX Acc No: N2001-025642
Connection part for borer for boring bone tissue; has inner holder unit with snap-in pin to engage grooves in borer and sliding sleeve that can be moved to lock pin in place
Patent Assignee: KIRSCH A (KIRS-I); W & H DENTALWERK BUERMOOS GMBH (WHDE-N)
Inventor: DUERR W; EIBL J; KARDEIS R; KIRSCH A

Patent Family (2 patents, 1 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
DE 19918638	A1	20001130	200105	B
DE 19918638	C2	20010920	200154	E

Local Applications (no., kind, date): DE 19918638 A 19990423; DE 19918638 A 19990423
Priority Applications (no., kind, date): DE 19918638 A 19990423

Alerting Abstract DE A1
NOVELTY - The connection part has an inner holder unit to hold a **bore**r shaft and to couple the **bore**r to a driven part element of the connection part. The holder unit has a snap-in **pin** (17) to engage one

or more grooves (42) of the **borer**. A sliding sleeve (13) at least partly surrounds the **pin** and can be moved between a locked **position**, in which it blocks movement of the **pin** from a catch **position**, and a free **position**, in which the **pin** is released.
DESCRIPTION - An INDEPENDENT CLAIM is included for a **borer** device incorporating the connection part.
USE - For **borer** for **boring** or **drilling bone** tissue.
ADVANTAGE - Secure connection of **borer** shaft to connector.
DESCRIPTION OF DRAWINGS - The figure shows a cross-section through a **borer** device with an axial **coolant** supply.
1 Angle piece
3 **Borer**
7 Bearing
8 Widened **bore**
9 Spacer sleeve
11 Groove
13 Sliding sleeve
15 Split washer
16 Base of split washer
17 Snap-in **pin**
19 Bearing
21 Projection of split washer
23 Spring
30 Ring
32 Push button
40 Widening of **borer** shaft
42 Annular groove
44 Catch head
46 Inclined surface
48 Widened area of sliding sleeve
50 Bevelling
52 Bevelled section
60,64,66 **Bores**
62 **Opening**

7/25,K/2 (Item 2 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0009579304 *Drawing available*
WPI Acc no: 1999-526841/199944
XRAM Acc no: C1999-154736
XRPX Acc No: N1999-390208
Self expanding dental implant
Patent Assignee: SAWA S T (SAWA-I)
Inventor: SAWA S T

Patent Family (1 patents, 1 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
US 5951288	A	19990914	199944	B

Local Applications (no., kind, date): US 1998111135 A 19980703
Priority Applications (no., kind, date): US 1998111135 A 19980703

Alerting Abstract US A

NOVELTY - The implant (210) comprises an elongate body which has a neck portion and a root portion, an abutment which is mounted to the neck portion and which receives the **temp**orary or permanent **replacement** tooth and a **screw** which secures the abutment to the body. The root portion consists of multiple legs and is **form**ed from a shape memory alloy. The distal ends of the legs assume a closed, elongate shape at **cool temperature**s and an open, fanned shape at **temperature**s typical of the human body.
DESCRIPTION - AN INDEPENDENT CLAIM is also included for a method of implanting a dental implant in the jaw of a living animal. The method involves **making** an incision in the gum to expose the jaw **bone**, verifying implant location and direction by **form**ing a small diameter **hole** using a first **drill** and enlarging the **hole** to a final depth and diameter using a second **drill** with a diameter the same as that of the implant. The upper portion of the **hole** is enlarged by **drilling** the upper portion with a counter **bore** and concurrent with each of the **drill**ing steps, a continuous **cold water wash** is provided over the surgical site to prevent heat-induced tissue damage. The implant is **insert**ed into the **hole**, while concurrently **cooling** it with a cold **water** wash to prevent premature expansion. Finally, the cold **water** wash is discontinued and the implant expands as the surgical site warms to body **temperature**.
Preferred Features: The shape memory alloy is preferably Nickel-Titanium alloy, however, other shape memory alloys such as Titanium-Palladium or Titanium-Palladium-Cobalt can be used.
USE - For surgical **place**ment in the **bone** of the jaw to provide an **anchor**ing for an artificial tooth.
ADVANTAGE - The implant is maintained at **cool temperature**s until and during **insert**ion into the body allowing an easy and non-traumatic **place**ment of the implant.
DESCRIPTION OF DRAWINGS - The figure illustrates a subsequent step of the method of using the implant, showing the abutment attached to the neck of the implant.

Original Abstracts:neck portion and a root portion; an abutment which is mounted to the neck portion of the body and which receives the **temp**orary or permanent **replacement** tooth; and a **screw** which secures the **abutment** to the body. The root portion of the body consists of multiple legs and is **form**ed from a shape memory alloy. Use of shape memory...

7/25,K/3 (Item 3 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0006469215 *Drawing available*
WPI Acc no: 1993-274376/199335
Related WPI Acc No: 1991-126301; 1993-251189
XRPX Acc No: N1993-210701
Cutter for forming precision frusto-conical holes in bones - has coaxial cylindrical rigid bodies having their diameter decreasing towards tip of cutter
Patent Assignee: VRESPA G (VRES-I)
Inventor: VRESPA G

Patent Family (1 patents, 14 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
EP 557899	A1	19930901	199335	B

Local Applications (no., kind, date): EP 1990119459 A 19901011; EP 1993102624 A 19901011
Priority Applications (no., kind, date): IT 198922139 A 19891026

Alerting Abstract EP A1
The cutter (100) consists of a shank (102) of conventional shape, with a spacer portion or extension (104), and a cutter portion (106). The shank (102) is connected into the already mentioned quick-connection coupling of the **drill**.
The actual cutter part (106) consists of three coaxial cutting bodies (103,105 and 107) which are rigid with each other and arranged to **pro**duce three **hole** portions of circular cross-section and has a diameter which respectively **decrease**s towards the interior of the **bone**.
ADVANTAGE - Provides a **screw** device for fixing prostheses to **bone**s, such as to result in

spontaneous repair (by creeping substitution) of the lamellar **bone** tissue around the **screw**, so the **screw** becomes thus securely and permanently fixed in the **bone**.

Original Abstracts:obtained by using a cutter (100) in the shape of an inverted "wedding cake", then reaming the obtained **cavity** with a manual reamer (140), and **tapping** said **hole** with a **tapper** (60;100), and **screw**ing the **screw** (10;80) into it.
In the **tapp**ered precision **hole** (40) is then **inserted** a **screw** device (10;80) for fixing prostheses to **bones**. The **screw** has a threaded shank (14) comprising a core (32,34) of overall frustoconical shape, and... **Claims**:1. A **bone** tissue cutter (100), of the type **cooled** by sterile **liquid** which also serves the purpose of removing the **bone** shavings which **form**, characterised in that the cutting part (106) of the cutter (100) comprises a...

7/25,K/4 (Item 4 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0004321918 *Drawing available*
WPI Acc no: 1988-051470/198808
Anchor for dental prosthesis - has cylindrical body with cavity having surrounding apertures for tissue growth
Patent Assignee: ROSS SYST CORP (ROSS-N); ROSS SYSTEMS CORP (ROSS-N)
Inventor: ROSS S E

Patent Family (14 patents, 19 countries)

Patent Number	Kind	Date	Update	Type
EP 256708	A	19880224	198808	B
AU 198776780	A	19880218	198815	E
US 4738619	A	19880419	198818	E
DK 198704189	A	19880214	198819	E
BR 198704189	A	19880412	198820	E
US 4744753	A	19880517	198822	E
US 4744754	A	19880517	198822	E
US 4744755	A	19880517	198822	E
US 4744756	A	19880517	198822	E
US 4787848	A	19881129	198850	E
US 4820156	A	19890411	198917	E
CN 1987105608	A	19880316	198918	E
US 4886456	A	19891212	199007	E
DD 301980	A9	19941006	199443	E

Local Applications (no., kind, date): EP 1987306692 A 19870729; US 1986876524 A 19860813; US 1986896101 A 19860813; US 1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125 ; US 1986947176 A 19861229; US 1986876524 A 19860813; US 1986896101 A 19860813; US 1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125 ; US 1986947176 A 19861229; US 1986876524 A 19860813; US 1986896101 A 19860813; US 1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125 ; US 1986947176 A 19861229; US 1986876524 A 19860813; US 1986896101 A 19860813; US 1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125 ; US 1986947176 A 19861229; US 1986876524 A 19860813; US 1986896101 A 19860813; US

1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125 ; US 1986947176 A 19861229; US 1986876524 A 19860813; US 1986896101 A 19860813; US 1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125 ; US 1986947176 A 19861229; US 1986876524 A 19860813; US 1986896101 A 19860813; US 1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125 ; US 1986947176 A 19861229; US 1986876524 A 19860813; US 1986896101 A 19860813; US 1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125 ; US 1986947176 A 19861229; US 1988192128 A 19880510; DD 305968 A 19870812
Priority Applications (no., kind, date): US 1986876524 A 19860813; US 1986896101 A 19860813; US 1986896524 A 19860813; US 1986920781 A 19861020; US 1986920796 A 19861020; US 1986934638 A 19861125; US 1986934651 A 19861125; US 1986947176 A 19861229; US 1988192128 A 19880510

Alerting Abstract EP A
The dental **anchor** (10) has a cylindrical body which is open at a front end. This **form**s a cylindrical front **cavity** (14) communicating with the open end to receive a cylindrical **bore** core. The portion of the body surrounding the **cavity** has **aperture**s (24) to accommodate growth of **bone** tissue.
The body has a rear **cavity** (16) which is internally threaded to receive externally threaded prosthesis attachments. The front and rear portions of the body include front and rear non-threaded outer peripheries (52,38).
ADVANTAGE - **Reduc**ed installation trauma.

Equivalent Alerting Abstract ...USE - Selection of a dental **anchor** for **insertion** into a jaw **bone** of a patient... ...heat-meltable material. A dimensionally stable, heat-meltable material is applied to the post and around the sleeve. The heat-meltable materials are melted and **replaced** by a permanent material. A **screw** is **inserted** into the sleeve **prior** to the melting step. The melting and **replacing** steps comprise steps in an investment-type casting procedure where a unit comprised...A **bore** is **form**ed in the jaw **bone** of a patient by a trephine **drill** having a hollow head. A **pilot hole** is initially **drilled** in the jaw **bone** and a **guide** bushing is installed in the **pilot hole**. Th **drill** head is **insert**ed telescopingly over a **guide** portion of the bushing and is advanced into the **bone** until the **drill** head abuts an end of... ...The length of the **bore** is extended by advancing the **drill** further into the **bone** relative to a stop which is freely longitudinally slidably situated on the **drill**. When the stop becomes sandwiched between the jawThe dental trephine **drill** cuts a **bore** having a central core. The **drill** includes a shank having a **fluid** passage for conducting **drill**ing **fluid** and a cutting head disposed at a front end of the shank. The cutting... ...edge of which defines a side cutting edge. An **aperture** in each groove communicates the grooves with the interior of the head for conducting **drill**ing **fluid** into the grooves to **cool** the **drill** head and **bone** tissue... ...USE - Dental trephine **drill** which cuts a **bore** but leaves a central protruding stub... ...heat-meltable material. A dimensionally stable, heat-meltable material is applied to the post and around the sleeve. The heat-meltable materials are melted and **replaced** by a permanent material. A **screw** is **inserted** into the sleeve **prior** to the melting step. The melting and **replacing** steps comprise steps in an investment-type casting procedure...

Original Abstracts:of said **anchor**. Other aspects of the invention relate to a method of implanting the **anchor**, methods of **form**ing an associated dental prosthesis, methods of **drilling** the **bore** in **the** jaw, **and** a method of selecting an appropriate dental **anchor**... ... The selection of a dental **anchor** for **insertion** into a jaw **bone** of a **patient** is **achieved** utilizing a transparent transfer sheet carrying on a first side thereof a plurality of removable pictorial representations of dental **anchor**s of different sizes. The transfer sheet is superimposed **over** an X-ray to **position** different ones of the pictorial representations over a site of the X-ray where a dental implant is to be installed. When a pictorial representation... ... heat-meltable material. A dimensionally stable, heat-meltable material is applied to the post and around the sleeve. The heat-meltable materials are melted and **replaced** by a permanent material. A **screw** is **inserted** into the sleeve **prior** to **the** melting step. The melting and **replacing** steps **comprise** steps in an investment-type casting procedure wherein a unit comprised **of** the post, the sleeve, the **screw**, and the heat-meltable materials is embedded in an investment material such that a head of the **screw** is embedded in the investment material to maintain the **positional** relationship of the **sleeve** relative to the post during the melting step. A release material

is applied over a body defined by the permanent material. A dimensionally stable, heat... ... material is applied over the release material and is melted and **replaced** with a permanent material which **forms** an overlay capable of being removed upon **removal** of the **screw**. ... A **bore** is **formed** in the jaw **bone** of a patient by means of a trephine **drill** having a hollow head. A **pilot hole** is initially **drilled** in the jaw **bone** and a **guide** bushing is installed in the **pilot hole**. The **drill** head is **inserted** telescopingly over a **guide** portion of the bushing and is advanced **into** the **bone until** the **drill** head abuts an end of the **guide** portion to terminate **drill advancement**. The **length** of the **bore** is extended by advancing the **drill** further into the **bone** relative to a stop member which is freely longitudinally slidably situated on the **drill**. When the stop **member** becomes sandwiched between the jaw **bone** and a surface movable with **a** motor housing carrying the **drill**, it is assured that the desired **bore** depth has been obtained. ... ... A dental trephine **drill** cuts a **bore** having a central core. The **drill** includes a shank having a **fluid** passage for conducting **drilling fluid** and a cutting head disposed at a front end of the shank. The cutting head includes front and **side** faces. The **end** face surrounds a central **hole and** includes a plurality of end cutting edges extending from **the hole to** an outer periphery of the end face. The side face includes a plurality of longitudinal grooves, a longitudinal edge of which defines a side cutting edge. An **aperture** in each groove communicates the grooves with the interior **of** the head for conducting **drilling fluid into** the grooves to **cool the drill** head and **bone** tissue. A dental prosthesis is **formed** by attaching an... ... meltable material. A dimensionally stable, heat-meltable material is applied to the post and around the sleeve. The heat-meltable materials are melted and **replaced by** a permanent material. A **screw is inserted into** the sleeve **prior** to the melting step. The melting and **replacing** steps comprise steps in an investment-type casting procedure wherein a unit comprised of the post, the sleeve, the **screw**, **and** the heat-**meltable** materials is embedded in an **investment** material **such** that a head of the **screw is** embedded in the investment **material** to maintain the **positional** relationship of the sleeve relative to the post during the melting step. A release material is applied over a body defined

10/25,K/1 (Item 1 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0006726187 *Drawing available*
WPI Acc no: 1994-108221/199413
XRPX Acc No: N1994-084467
Orthopaedic pin introduction instrument - has body with three cavities, contg sprung slide valve, and compression and extension bellows respectively
Patent Assignee: KAZAN SECT KURGAN REHABILITATION TRAUMA (KZSE-R)
Inventor: KAZANTSEV F F; KHABIBYANOV R YA; PLAKSEICHUK YU A

Patent Family (1 patents, 1 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
SU 1792672	A1	19930207	199413	B

Local Applications (no., kind, date): SU 4926991 A 19910228
Priority Applications (no., kind, date): SU 4926991 A 19910228

Alerting Abstract SU A1
The **pin introduction** instrument has a **guide** pipe (1) and body (2) with handle and three **cavities** (3-5). Body (2) is mounted on pipe (1). **Cavity** (3) holds valve (6) with ring borings (7,8) contacting with spring (9) in the same **cavity**. **Cavities** (4,5) hold compression (10) and extension (11) bellows, The bellows (10) is filled with aseptic **cooling liquid** and contacts with spring (12). Bellows (11) is filled with used **liquid** and **makes** contact with spring (13).
Pipe (1) has **liquid** supply **apertures** (14) and **liquid** aspiration **apertures** (15). **Apertures** (14,15) are joined by canals (16,17) to **cavity** (3) of the valve system. The conical outlets (18) of bellows (10,11) are linked to canals (16,17) and sealed with washers (19). Body (2) is **made** in the **form** of a pistol with trigger (20) linked to valve (6). The end of pipe (1) into which the **pin** is **inserted** is sealed by a rubber bush (21).

USE/ADVANTAGE - For **introduc**ing orthopaedic **pin**s, **reduc**ing trauma by **cool**ing the **pin** and **bone** tissue during **drilling**. Bul.5/7.2.93

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Foreign & International Patent Search #2

Search Strategy

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Set     Items   Description
S1     168418   BONE OR BONES OR BONY OR BONEY OR OSSEOUS? OR OSTEAL? OR O-
             STEO? OR VERTEBRA? ? OR INTERVERTEBR? OR INTRAVERTEBR? OR SPI-
             NE? ? OR SPINAL? OR FEMUR OR HUMERUS OR VERTEBROPLAST? OR (HA-
             RD OR SKELETAL? OR CORTICAL? OR CANCELLOUS? OR CORTICOCANCELL-
             OUS) (2W) TISSUE? ?
S2       3387   (DRILL? OR CREATE? OR CREATING OR CREATION OR TAP OR TAPS -
             OR TAPP??? OR BORING OR CUT OR CUTS OR CUTTING OR CUTTER? OR -
             REAM??? OR PREPAR?) (5N) (HOLE OR HOLES OR BORE? ? OR CAVITY?
             OR CAVITIES OR RECESS OR RECESSES)
S3       1302   (PILOT OR PREFORM? OR PREVIOUS? OR PRIOR? OR GUIDE? ? OR G-
             UIDING?) (3N) (HOLE OR HOLES OR BORE? ? OR CAVITY? OR CAVITIES
              OR RECESS OR RECESSES)
S4       2775   (COOL??? OR FLUSH? OR CHILL? OR (REDUC? OR DECREAS? OR LOW-
             ER? OR LESSEN?) (2N) (TEMP OR TEMPS OR TEMPERATURE?)) (5N) (F-
             LUID? OR LIQUID? OR WATER OR SALINE OR H2O OR RINGER OR RINGE-
             RS OR MEDIA OR MEDIUM OR SOLUTION? ?) OR COOLANT?
S5       8973   (INSERT? OR PLACE? OR PLACING OR REPLAC? OR POSITION? OR I-
             NTRODUC? OR DELIVER? OR PUT OR PUTS OR PUTTING OR INSTALL?) (-
             5N) (FASTENER? OR SCREW? ? OR NAIL? ? OR ROD OR RODS OR ANCHO-
             R? ? OR PIN OR PINS)
S6          2   S2:S3 (S) S4 (S) S5
S7          7   S2:S3 AND S4 AND S5
S8          5   S7 NOT S6
S9      27605   FASTENER? OR SCREW? ? OR NAIL? ? OR ROD OR RODS OR ANCHOR?
             ? OR PIN OR PINS OR STAPLE? ?
S10         7   S2:S3(S)S4(S)S9
S11         3   S10 NOT (S6 OR S8)
S12        34   S2:S3(S)S4
S13        25   S12 NOT (S6 OR S8 OR S11)
S14       378   (MAKE? ? OR MAKING) (5N) (HOLE OR HOLES OR BORE? ? OR CAVI-
             TY? OR CAVITIES OR RECESS OR RECESSES)
S15         0   S14 AND S4 AND S5
S16         8   S14(S)S4
S17         5   S16 NOT (S6 OR S8 OR S11 OR S13)
S18      2233   (DRILL? OR CREATE? OR CREATING OR CREATION OR TAP OR TAPS -
             OR TAPP??? OR BORING OR CUT OR CUTS OR CUTTING OR CUTTER? OR -
             REAM??? OR PREPAR? OR MAKE? ? OR MAKING OR FORM? ? OR FORMED -
             OR FORMING) (5N) (HOLE OR HOLES OR BORE? ? OR CAVITY? OR CAVI-
             TIES OR RECESS OR RECESSES) (5N) S9
S19         8   S18 AND S4
S20         1   S19 NOT (S6 OR S8 OR S11 OR S13 OR S17)


File 350:Derwent WPIX 1963-2009/UD=200935
         (c) 2009 Thomson Reuters
File 347:JAPIO Dec 1976-2009/Jan(Updated 090503)
         (c) 2009 JPO & JAPIO
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Search Results

13/25,K/3 (Item 3 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0015798758 *Drawing available*
WPI Acc no: 2006-355031/200637
Related WPI Acc No: 2006-363258
XRPX Acc No: N2006-301409
Bone boring drill for e.g. dental implantology, has step with diameter larger than that of drill, mandrel with bore for allowing passage of cooling liquid, and lateral blade for cutting bone that is received in adjacent cavity
Patent Assignee: YEUNG J C (YEUN-I)
Inventor: YEUNG J C

Patent Family (1 patents, 1 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
FR 2878146	A1	20060526	200637	B

Local Applications (no., kind, date): FR 200412442 A 20041124
Priority Applications (no., kind, date): FR 200412442 A 20041124

Alerting Abstract FR A1
NOVELTY - The **drill** (100) has a step (116), a mandrel (114) at an upper end, a blade at an end (111) for boring, and a lateral blade (112) for cutting a **bone** that is received in an adjacent **cavity** (113). The **cavity** is deep and presents a semi-circular area, and the mandrel presents a **bore** (115) for allowing passage of a **cooling liquid**. The step presents diameter larger than the diameter of the **drill**.
USE - Used in dental implantology or other **bone** surgery for boring a **bone**.
ADVANTAGE - The mandrel at the upper end presents **bore** for allowing passage of **cooling liquid**, thus **cooling** the **bone** site and permitting the **drill** to have an inner perfusion. The step presents diameter larger than the diameter of the **drill**, thus limiting the driving in of the **drill** in the **bone**.
DESCRIPTION OF DRAWINGS - The drawing shows a front view of a **bone** boring **drill**.
100 **Bone** boring **drill**
111 End of **drill**
112 Lateral blade
113 **Cavity**
114 Mandrel
115 **Bore**
116 Step

13/25,K/5 (Item 5 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0013461555 *Drawing available*
WPI Acc no: 2003-553055/200352
XRPX Acc No: N2003-438943
Method for treating jaw fractures using temporary intraosseous implants
Patent Assignee: TVER MED AKAD (TVER-R)
Inventor: BOGATOV V V; KOGAN M R

Patent Family (1 patents, 1 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
RU 2207073	C1	20030627	200352	B

Local Applications (no., kind, date): RU 2002109186 A 20020410
Priority Applications (no., kind, date): RU 2002109186 A 20020410

Alerting Abstract RU C1
NOVELTY - Method involves building orthopantogram and determining interrelation dental root apices. Retractor and saliva suction unit are **introduce**d into the oral **cavity**. Alveolar process is trepanized to reach spongious substance in **cool**ing the **drill** with nitrofurazone **solution**. Thread is **tapped** in **bored** trepanation canal. **Cut** hook is applied for joining splitters. The hook is fixed in needle holder. The hook travels clockwise 1 cm far from fracture fissure. Immobilization period being over, control orthopantogram is built and the hooks are **screw**ed out.
USE - Medicine.
ADVANTAGE - **Reduce**d risk of injuries; accelerated surgical treatment process; allowed combination with other osteosynthesis methods. 1 cl

13/25,K/7 (Item 7 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0011092149 *Drawing available*
WPI Acc no: 2002-027750/200204
XRPX Acc No: N2002-021414
Rotating drill to make bore in jawbone of patient for fitting of dental implant has straight cutting blades on either side of central bore
Patent Assignee: BUSCH & CO KG (BUSC-N)
Inventor: BUSCH G

Patent Family (2 patents, 30 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
DE 20115184	U1	20011115	200204	B
EP 1293173	A2	20030319	200322	E

Local Applications (no., kind, date): DE 20115184 U 20010914; EP 200218477 A 20020816
Priority Applications (no., kind, date): DE 20115184 U 20010914

Alerting Abstract DE U1
NOVELTY - The dental **drill** has a smooth shaft (3) with its top end shaped to fit in a chuck (2). It has spiral **drill** flutes (5) at the **lower** end. The tip has a cutting blade (7) on either side of the end of the central **bore** (9). The cutting blades are straight in side view and have angled cutting edges (8). **Cooling fluid** is pumped down the central **bore** to the tip.
USE - **Drill** for **making** blind **bore** in **bone** to receive dental implant.
ADVANTAGE - **Drill**ed **hole** is **flushed** out with **cooling fluid** and overheating of **drill** tip is prevented.
DESCRIPTION OF DRAWINGS - The drawing shows a side view of the **drill**.
2 Chuck
3 Smooth shaft of **drill**
5 Spiral **drill** flutes
7 Cutting blades
8 Angled cutting edges
9 Central **bore**

13/25,K/14 (Item 14 from file: 350)
DIALOG(R)File 350: Derwent WPIX

0009524947 *Drawing available*
WPI Acc no: 1999-469216/199939
XRPX Acc No: N1999-350361
Drill for making bore holes in bone tissue
Patent Assignee: KIRSCH A (KIRS-I)
Inventor: DUERR W; KIRSCH A

Patent Family (6 patents, 82 countries)				
Patent Number	**Kind**	**Date**	**Update**	**Type**
WO 1999038450	A1	19990805	199939	B
DE 19803998	A1	19990819	199939	E
AU 199928255	A	19990816	200002	E
DE 19803998	C2	20030327	200324	E
AT 199909014	A	20030815	200363	E
AT 411567	B	20040215	200414	E

Local Applications (no., kind, date): WO 1999DE273 A 19990202; DE 19803998 A 19980202; AU 199928255 A 19990202; DE 19803998 A 19980202; AT 19999014 A 19990202; WO 1999DE273 A 19990202; AT 19999014 A 19990202; WO 1999DE273 A 19990202
Priority Applications (no., kind, date): DE 19803998 A 19980202

Alerting Abstract WO A1
NOVELTY - The **drill** has a chuck (1) **form**ing a detachable or fixed part of the **drill**. The **drill** bit has a shank (3) with a **cool**ant supply system (24, 26) which, when the shank is **insert**ed in the chuck, is supplied from a boring (18) in the chuck shaft (6). A locking system (32,34,38,40) holds the **drill** shank securely in the chuck
USE - In dentistry for **drill**ing out seats for implants
ADVANTAGE - The **drill** bit when worn out can be **replace**d eliminating the need to **replace** the whole **drill** unit. The **drill** can be manufactured and marketed at a favourable price and is easy to use
DESCRIPTION OF DRAWINGS - The figure a section through a bit and chuck shows to the present invention.
1 chuck
3 **drill** shank
6 chuck shaft
18 boring
24,26 **cool**ant supply system
32,34,38.40 locking system

Original Abstracts:mount. Once assembled, the shaft engages inside the **bore hole** and the **drill** mount is secured on the retaining part. The retaining part and the **drill** mount each have a **coolant bore hole** provided **for deliver**ing a **coolant**,whereby **the coolant bore hole** of the one **part** has an **opening** in the **bore hole** of the sleeve, and the **coolant bore hole** of the other part has an **opening** in the area of the respective section of the shaft which is accommodated in the sleeve in a coupled state such that a **coolant** connection is **pro**duced for **deliver**ing **coolant** from the **retaining** part to the **drill** mount.

13/5/25 (Item 1 from file: 347)
DIALOG(R)File 347: JAPIO

03996646 **Image available**
DENTAL BONE PROCESSING TOOL AND DEVICE

Pub. No.: 04-361746 [JP 4361746 A]
Published: December 15, 1992 (19921215)
Inventor: INOUE KIYOSHI
Applicant: I N R KENKYUSHO KK [000000] (A Japanese Company or Corporation), JP (Japan)
Application No.: 03-136566 [JP 91136566]
Filed: June 07, 1991 (19910607)
International Class: [5] A61C-008/00; A61C-003/02
JAPIO Class: 28.2 (SANITATION -- Medical)
Journal: Section: C, Section No. 1055, Vol. 17, No. 225, Pg. 111, May 10, 1993 (19930510)

ABSTRACT
PURPOSE: To provide a **bone** processing tool and device, with which a groove and **hole** for implantation of artificial tooth root can be processed in a jaw **bone** simultaneously and precisely.

CONSTITUTION: A major dia. rotary cutter or cutters 4, 4 are mounted on a rotary shaft 3 of a **bone** processing tool concerned, and minor dia. rotary cutters 5, 5 are installed in between and on the outsides. It is recommendable that different sorts of minor dia. rotary cutters 5, 5 having a unit thickness of diameter corresponding to the shape of **hole** to be processed are **prepared** in combination and stacked firmly. The device used upon mounting of this **bone** processing tool is equipped with an arrangement to spout **cooling water** to the part with rotary cutters. This permits simultaneous processing of groove and **hole**, which should allow precise location of them to lead to enhancement of the processing accuracy, and an artificial tooth root can be implanted stably and sturdily.

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NPL Database Search – Bibliographic/abstract databases

Search Strategy

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Set     Items   Description
S1    3482853   BONE OR BONES OR BONY OR BONEY OR OSSEOUS? OR OSTEAL? OR O-
               STEO? OR VERTEBRA? ? OR INTERVERTEBR? OR INTRAVERTEBR? OR SPI-
               NE? ? OR SPINAL? OR FEMUR OR HUMERUS OR VERTEBROPLAST? OR (HA-
               RD OR SKELETAL? OR CORTICAL? OR CANCELLOUS? OR CORTICOCANCELL-
               OUS) (2W) TISSUE? ?
S2     244671   (COOL??? OR FLUSH? OR CHILL? OR (REDUC? OR DECREAS? OR LOW-
               ER? OR LESSEN?) (2N) (TEMP OR TEMPS OR TEMPERATURE?)) (5N) (F-
               LUID? OR LIQUID? OR WATER OR SALINE OR H2O OR RINGER OR RINGE-
               RS OR MEDIA OR MEDIUM OR SOLUTION?) OR COOLANT?
S3       1519   S1 AND S2
S4         62   (DRILL? OR CREATE? OR CREATING OR CREATION OR TAP OR TAPS -
               OR TAPP??? OR BORING OR CUT OR CUTS OR CUTTING OR CUTTER? OR -
               REAM??? OR PREPAR? OR MAKE? ? OR MAKING OR FORM? ? OR FORMED -
               OR FORMING) (5N) (HOLE OR HOLES OR BORE? ? OR CAVITY? OR CAVI-
               TIES OR RECESS OR RECESSES)
S5          1   (PILOT OR PREFORM? OR PREVIOUS? OR PRIOR? OR GUIDE? ? OR G-
               UIDING?) (3N) (HOLE OR HOLES OR BORE? ? OR CAVITY? OR CAVITIES
                OR RECESS OR RECESSES)
S6          7   (INSERT? OR PLACE? OR PLACING OR REPLAC? OR POSITION? OR I-
               NTRODUC? OR DELIVER? OR PUT OR PUTS OR PUTTING OR INSTALL?) (-
               5N) (FASTENER? OR SCREW? ? OR NAIL? ? OR ROD OR RODS OR ANCHO-
               R? ? OR PIN OR PINS)
S7          3   S4:S5 AND S6
S8          1   RD  (unique items)
S9          6   S6 NOT S8
S10         3   RD  (unique items)
S11         3   S4 AND (FASTENER? OR SCREW? ? OR NAIL? ? OR ROD OR RODS OR
               ANCHOR? ? OR PIN OR PINS)
S12         0   S11 NOT (S8 OR S9)

File 155:MEDLINE(R) 1950-2009/Jun 08
         (c) format only 2009 Dialog
File  73:EMBASE 1974-2009/Jun 08
         (c) 2009 Elsevier B.V.
File   5:Biosis Previews(R) 1926-2009/Jun W1
         (c) 2009 The Thomson Corporation
File  23:CSA Technology Research Database 1963-2009/Jun
         (c) 2009 CSA.
File  24:CSA Life Sciences Abstracts 1966-2009/Jun
         (c) 2009 CSA.
File   8:Ei Compendex(R) 1884-2009/May W5
         (c) 2009 Elsevier Eng.  Info. Inc.
File 144:Pascal 1973-2009/Jun W1
         (c) 2009 INIST/CNRS
File  35:Dissertation Abs Online 1861-2009/May
         (c) 2009 ProQuest Info&Learning
File  65:Inside Conferences 1993-2009/Jun 10
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Search Results

No relevant results.

NPL Database Search – Full text files

Search Strategy

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Set     Items   Description
S1     416134   BONE OR BONES OR BONY OR BONEY OR OSSEOUS? OR OSTEAL? OR O-
             STEO? OR VERTEBRA? ? OR INTERVERTEBR? OR INTRAVERTEBR? OR SPI-
             NE? ? OR SPINAL? OR FEMUR OR HUMERUS OR VERTEBROPLAST? OR (HA-
             RD OR SKELETAL? OR CORTICAL? OR CANCELLOUS? OR CORTICOCANCELL-
             OUS) (2W) TISSUE? ?
S2       3527   (COOL??? OR FLUSH? OR CHILL? OR (REDUC? OR DECREAS? OR LOW-
             ER? OR LESSEN?) (2N) (TEMP OR TEMPS OR TEMPERATURE?)) (5N) (F-
             LUID? OR LIQUID? OR WATER OR SALINE OR H2O OR RINGER OR RINGE-
             RS OR MEDIA OR MEDIUM OR SOLUTION?) OR COOLANT?
S3       3922   (DRILL? OR CREATE? OR CREATING OR CREATION OR TAP OR TAPS -
             OR TAPP??? OR BORING OR CUT OR CUTS OR CUTTING OR CUTTER? OR -
             REAM??? OR PREPAR? OR MAKE? ? OR MAKING OR FORM? ? OR FORMED -
             OR FORMING) (5N) (HOLE OR HOLES OR BORE? ? OR CAVITY? OR CAVI-
             TIES OR RECESS OR RECESSES)
S4        216   (PILOT OR PREFORM? OR PREVIOUS? OR PRIOR? OR GUIDE? ? OR G-
             UIDING?) (3N) (HOLE OR HOLES OR BORE? ? OR CAVITY? OR CAVITIES
              OR RECESS OR RECESSES)
S5       2974   (INSERT? OR PLACE? OR PLACING OR REPLAC? OR POSITION? OR I-
             NTRODUC? OR DELIVER? OR PUT OR PUTS OR PUTTING OR INSTALL?) (-
             5N) (FASTENER? OR SCREW? ? OR NAIL? ? OR ROD OR RODS OR ANCHO-
             R? ? OR PIN OR PINS)
S6         13   S2:S3 (2S) S4 (2S) S5
S7         11   RD  (unique items)
S8       4759   S1(5N) (DRILL? OR TAP OR TAPS OR TAPP??? OR BORE? ? OR BOR-
             ING OR HOLE? ? OR CAVITY? OR CAVITIES OR RECESS???)
S9          1   S8 (2S) S2 (2S) S5
S10         1   S2(2S)S3:S4(2S)S5
S11         1   S9:S10
S12         0   S11 NOT S6

File 148:Gale Group Trade & Industry DB 1976-2009/May 26
         (c) 2009 Gale/Cengage
File 149:TGG Health&Wellness DB(SM) 1976-2009/May W2
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File  88:Gale Group Business A.R.T.S. 1976-2009/Jun 09
         (c) 2009 Gale/Cengage
File  47:Gale Group Magazine DB(TM) 1959-2009/May 29
         (c) 2009 Gale/Cengage
File 457:THE LANCET 1992-2009/MAY W5
         (c) 2009 ELSEVIER LTD.ALL RIGHTS RES
File  15:ABI/Inform(R) 1971-2009/Jun 09
         (c) 2009 ProQuest Info&Learning
File 441:ESPICOM Pharm&Med DEVICE NEWS 2009/Mar W3
         (c) 2009 ESPICOM Bus.Intell.
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Search Results

No relevant results.

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	("5259398").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2009/06/10 11:08
L2	78	("2121193" | "2472103" | "2570465" | "4341206" | "4858601" | "4959064" | "5061271" | "5078718" | "5116337" | "5139500").PN. OR ("5259398").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 11:09
L3	1925978	cool$5 (reduc$5 decreas$4 lower$3 lessen$4) near3 (temp temperature)	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 11:11
L4	4	l2 and l3	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 11:12
L5	46	("2112007" | "3499222" | "3514858" | "3656236" | "3905109" | "4177562" | "4234309" | "4268253" | "4359318" | "4431416" | "4486178" | "4488875" | "4531915" | "4645453" | "4713003" | "4713004" | "4738622" | "4744755" | "4762492" | "4854872" | "4856994" | "4906191" | "4907969" | "4932868" | "4978350" | "5007835" | "5022860" | "5078607" | "5087201" | "5108288" | "5195891" | "5209659" | "5246369" | "5254005" | "5259398" | "5269686" | "5443509" | "5468149" | "5593410"). PN. OR ("RE37646").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 11:15
L6	6	l3 and l5	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 11:16
L7	36	("4185383" | "4447209" | "4552532" | "4746293" | "4957437" | "4960381" | "5006068" | "5026280" | "5040982" | "5049073" | "5071351").PN. OR ("5246369").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 11:20
L8	65	("3499222" | "4180910").PN. OR ("4431416").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 11:26
L9	15	(l7 l8) and l3	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 11:29
L10	32	("2188631" | "2525669" | "2947206" | "4021920" | "4359318" | "4431416" | "4511334").PN. OR ("4820156").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 12:18

EAST Search History

L11	292938	bone femur femoral humerus humeral spine spinal vertebra vertebral intervertebr$ intravertebr$	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 12:39
L12	218031	(pilot preform$ guide guiding) near3 (hole bore cavity recess dimple opening aperture)	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 12:39
L13	1215742	(insert$4 place$2 placing placement replac$5 position$3 introduc$5 deliver$4 put putting install$ inset$4) near5 (fastener$ screw$3 nail rod anchor pin)	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 12:42
L14	856	l3 and l11 and l12 and l13	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 12:43
L15	7	l11 and (l3 same l12 same l13)	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 12:44
L16	77	("2857670" | "2880508" | "3579831" | "3589011" | "3726011" | "3797113" | "3952414" | "3955280" | "3979828" | "4086701" | "4178686" | "4195409" | "4215986" | "4259072" | "4270905" | "4318696" | "4324550").PN. OR ("4416629").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2009/06/10 12:50
L17	8	l16 and l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2009/06/10 12:52

US00RE37646E

(19) **United States**

(12) **Reissued Patent**

Zuest

(10) **Patent Number: US RE37,646 E**

(45) **Date of Reissued Patent: Apr. 9, 2002**

(54) **DENTAL IMPLANT SYSTEM**

(75) Inventor: **Max Zuest**, San Diego, CA (US)

(73) Assignee: **Sulzer Dental Inc.**, Houston, TX (US)

(21) Appl. No.: **09/226,743**

(22) Filed: **Jan. 7, 1999**

Related U.S. Patent Documents

Reissue of:

(64) Patent No.: **5,591,029**
Issued: **Jan. 7, 1997**
Appl. No.: **08/102,353**
Filed: **Aug. 5, 1993**

U.S. Applications:

(63) Continuation-in-part of application No. 07/861,183, filed on Mar. 31, 1992, now abandoned, which is a continuation of application No. 07/751,661, filed on Aug. 22, 1991, now Pat. No. 5,254,005, which is a continuation of application No. 07/436,432, filed on Nov. 14, 1989, now abandoned.

(51) **Int. Cl.**[7] **A61C 8/00**

(52) **U.S. Cl.** **433/173**; 433/174

(58) **Field of Search** 433/172, 173, 433/174

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(List continued on next page.)

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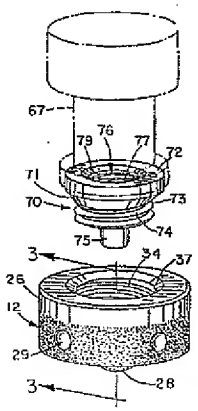
Primary Examiner—Ralph A. Lewis

(74) *Attorney, Agent, or Firm*—Patrick F. Bright

(57) **ABSTRACT**

A dental implant assembly is provided, as well as a system and method for exposing an embedded implant after osseointegration has taken place. The implant assembly comprises an implant member for embedding in the jaw and a rest factor member for securing to the implant member, the rest factor member having an upper rest surface just above the tissue level for opposing an overlying portion of a prosthesis anchored elsewhere in the jaw to form a non-retentive rest or support for accepting down pressure from the prosthesis. The implant member is relatively short and can be installed in distal jaw regions without interference with the mandibular nerve. A bore is cut out in the jaw for receiving the implant, inserting the implant and an attached healing screw in the implant. The implant site is closed and osseointegration takes place over an extended period. Subsequently, the implant site is uncovered, the healing screw is removed, and the rest factor member is secured in the implant.

36 Claims, 6 Drawing Sheets



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US-PAT-NO: RE37646

DOCUMENT-IDENTIFIER: US RE37646 E

TITLE: Dental implant system

---------- KWIC ---------

Detailed Description Text - DETX (13):

The method of inserting the implant 12 in the jaw will now be described with reference to FIGS. 6-11 of the drawings. This can easily be done by a dentist or dental surgeon. First, a bore shaped to correspond to the shape of member 12 must be cut out. This is done using a series of special cutting burrs. A first water **cooled** burr or cutter (not illustrated in the drawings) is used to drill a cylindrical guide hole or pilot dimple at the center of a selected site, for example under the second molar area or at the distal end of a cantilevered bridge. The width of the alveolar crest with equal distance on both sides of the pilot dimple is then measured. The largest diameter rest factor implant which will fit within the available width while allowing at least 1/2 mm of bone on each side of the implant is selected. An internally irrigated implant body drill 44 of diameter matching that of the selected rest factor implant is then selected. Burr 44, illustrated in FIG. 6, has a smaller diameter pilot drill 46 for cutting out a cylindrical bore 48 and a larger diameter portion 50 having an end cutter 52 for drilling out the larger diameter upper end 56 of the bore. The cylindrical portion 50 may be provided with suitable markings or a scale (not shown) so that the dentist can control the depth the drilled bore. However, in the preferred version, the height of portion 50 matches the height of implant member 12. The length of the pilot drill 46 will correspond to the length of spigot 28 of the implant,

so that
spigot 28 will fit in bore portion 48. The dentist determines the optimum
angle and drills in to the bone to a point where the larger diameter portion 50
ends.

Detailed Description Text - DETX (14):
FIG. 7 illustrates the operation of a water **cooled** guided core drill or burr
58 having a central guide or pilot tip 59 for fitting in the previously drilled
bore portion 48 to center the tool on the bore. The tool has a cylindrical
central body portion 60 having a downwardly facing annular ring of cutting
teeth 62 for drilling out an annular groove or channel 64 around the periphery
of the flat or shoulder 66 separating counter bore 56 from the smaller diameter
bore portion 48. The length of the teeth controls the depth of groove 64, and
will be equivalent to the height of the downwardly depending rim 30 of the
implant to be received in the bore. Once the lower face of body portion 60
hits the flat 66, drilling is stopped.

US Reference Patent Number - URPN (35):
5259398

US005961328A

United States Patent [19]

Somborac et al.

[11] Patent Number: 5,961,328

[45] Date of Patent: *Oct. 5, 1999

[54] DENTAL IMPLANT

[76] Inventors: Milan Somborac; Stefan Somborac, both of 229-6th St., Collingwood, Ontario, Canada, L9Y 1Z2

[*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: 08/871,848

[22] Filed: Jun. 9, 1997

Related U.S. Application Data

[63] Continuation-in-part of application No. 08/404,669, Jan. 23, 1995, Pat. No. 5,636,989.

[51] Int. Cl.[6] A61C 8/00

[52] U.S. Cl. 433/173

[58] Field of Search 433/172, 173, 433/174, 175, 176

[56] References Cited

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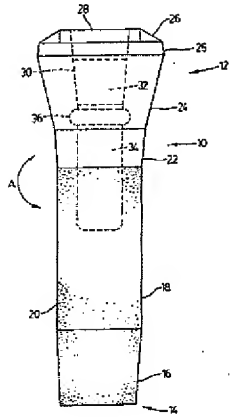
Excerpt from a paper entitled A Multicenter 5–Year Retrospective Survival Analysis of 6,200 Integral Implants written by E. Robert Stultz et al., and contained in "Compend Contin. Educ. Dent" (vol. XIV, No. 4).

Primary Examiner—Nicholas D. Lucchesi

[57] ABSTRACT

A dental implant for installation into a mouth is disclosed. The implant includes a one piece implant body to which is attached an abutment portion for anchoring a denture or tooth replacement. The implant body includes a coronal portion having a keyway. The abutment portion includes a key which mates with the keyway to form a non-rotational joint. In one aspect of invention, the abutment portion is cemented into the keyway. In another aspect of the invention, the key is tapped in to the keyway to form a cold weld. There is also shown a method of installing a dental implant which includes press fitting the implant body into a preformed cylindrical bore at the implant site. The abstract is made retrievable without disturbing the bone implant interface.

8 Claims, 14 Drawing Sheets



US-PAT-NO: 5961328

DOCUMENT-IDENTIFIER: US 5961328 A

TITLE: Dental implant

---------- KWIC ---------

Detailed Description Text - DETX (20):
The cylindrical section 94 has opposed cutting edges 96 (only one of which is shown). A tapered coronal portion 97 has one or more discrete, protruding cutting teeth 98 thereon. The taper on the coronal portion 97 may be referred to as the "third paper". Reference numeral 99 indicates another set of cutting edges on the tapered section 94 (which has three or four sets of such edges, as desired). A smaller diameter upper portion 100 of the drill 93 has a keyway adapter 101 at its top end for engaging a drive mechanism of a dentist's drill (not shown). A hollow stem or bore 102 extends through the drill 93 along its length, as shown. A saline **coolant** is delivered from the drill to an opening 103 though the bore 102 to **cool** and drill bit and prevent heat build up, which heat could damage the living cells being drilled into.

Detailed Description Text - DETX (21):
The use of the single final drill 93 is preceded by the use of a conventional smaller pilot drill (not shown). The pilot drill also has a hollow stem or bore to allow internal irrigation with normal saline solution. Additionally, external irrigation may be used (for both drills) to **cool** the site being drilled to prevent damage to the bone tissue during the site preparation.

US Reference Patent Number - URPN (11):
5246369

United States Patent [19]

Niznick

[11] **4,431,416**

[45] **Feb. 14, 1984**

[54] **ENDOSSEOUS DENTAL IMPLANT SYSTEM FOR OVERDENTURE RETENTION, CROWN AND BRIDGE SUPPORT**

[75] Inventor: **Gerald A. Niznick**, Encino, Calif.

[73] Assignee: **A & L Investment Company**, Encino, Calif.

[21] Appl. No.: **372,945**

[22] Filed: **Apr. 29, 1982**

[51] **Int. Cl.**³ **A61C 8/00**

[52] **U.S. Cl.** **433/174**

[58] **Field of Search** 433/173, 174, 175, 176

[56] **References Cited**

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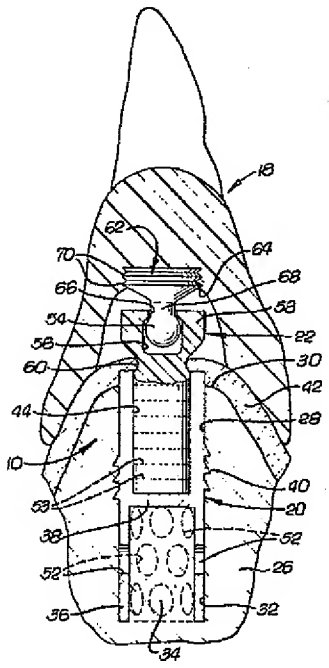
Primary Examiner—Robert Peshock

Attorney, Agent, or Firm—Fred Flam

[57] **ABSTRACT**

One part of the implant comprises a rigid screw anchor of substantially uniform diameter. The anchor has intermediate peripheral threads to engage the bone tissue at a prepared recess. The lower end of the anchor is hollow, peripherally perforated and open at the end to surround a bone core projecting from the bottom of the prepared recess. The upper end of the anchor has a relatively deep wrench socket for rotation of the anchor and for reception of a companion pillar part. The pillar part is made of slightly flexible plastic material that can approximate a prepared tooth to serve as a single tooth replacement or as a support for a fixed bridge. Optionally, the pillar can provide a platform that forms or mounts one of two companion elements of a connector structure such as for overdenture retention. The anchor can be altered in length not only at the bottom, but also at the top, without changing the manner in which the anchor cooperates with the later placed pillar.

24 Claims, 20 Drawing Figures



US-PAT-NO: **4431416**

DOCUMENT-IDENTIFIER: US 4431416 A

TITLE: Endosseous dental implant system for overdenture retention, crown and bridge support

---------- KWIC ---------

US Patent No. - PN (1):
4431416

Detailed Description Text - DETX (27):
The drill 120 shown in FIGS. 14, 15 and 16, has an inverted cylindrical cup 122 with teeth 123 at its lower end. The shank 124 of the drill 120 connects to a latch-type slow speed contra angle hand piece (not shown). The shank has a through passage 126 to allow movement of a **cooling** fluid. Both the cup 122 and the shank 124 have circular markings 128 and 130 so that the depth of cut can be gauged. The part of the cup below the markings 128 is provided with peripheral ridges 132 that slant upwardly to guide material outwardly. Fluid that enters the drill cup via passage 126 may move out through holes 127 in the cup 122. Some fluid may move downwardly to the teeth 123, and then outwardly and upwardly along the flow channels formed by the ridges 132.

United States Patent [19]

Mozsary et al.

[11] **4,416,629**

[45] **Nov. 22, 1983**

[54] **OSSEOINTERFACED IMPLANTED ARTIFICIAL TOOTH**

[76] Inventors: **Peter G. Mozsary**, 530 Tennessee Ave., Vallejo, Calif. 94590; **Robert E. Lapcevic**, 40 N. Gate Victoria Ave., Milpitas, Calif. 95035

[21] Appl. No.: **395,139**

[22] Filed: **Jul. 6, 1982**

[51] **Int. Cl.**³ **A61C 8/00**

[52] **U.S. Cl.** **433/174**; 433/173

[58] **Field of Search** 433/173, 174, 175, 176, 433/169, 170, 220, 221, 201

[56] **References Cited**

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2401323	7/1974	Fed. Rep. of Germany	433/174
2413883	9/1975	Fed. Rep. of Germany	433/173

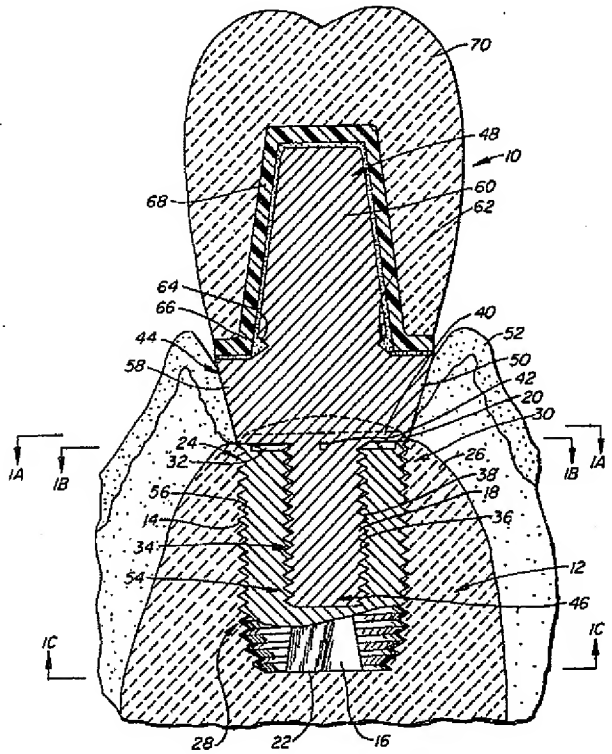
Primary Examiner—John J. Wilson

Attorney, Agent, or Firm—Theodore J. Bielen, Jr.

[57] **ABSTRACT**

An artificial tooth implantable in a jaw bone utilizing a tooth root having distal and proximal end portions. The distal end portion of the root extends into the jaw bone and is fixed to the jaw bone. A hollow root extends from the proximal end portion of the root which is accessible from the outer surface of the jaw bone, toward the distal end portion of the root. A post has a first end portion which extends into the hollow of the root and is fixed to the root. A second portion of the post extends outwardly from the hollow and has an outer surface which slopes downwardly toward the first portion of the post. A crown is connected to the second portion of the post.

8 Claims, 6 Drawing Figures



US-PAT-NO: 4416629

DOCUMENT-IDENTIFIER: US 4416629 A

TITLE: Osseointerfaced implanted artificial tooth

---------- KWIC ---------

Abstract Text - ABTX (1):

An artificial tooth implantable in a jaw **bone** utilizing a tooth root having distal and proximal end portions. The distal end portion of the root extends into the jaw **bone** and is fixed to the jaw **bone**. A hollow root extends from the proximal end portion of the root which is accessible from the outer surface of the jaw **bone,** toward the distal end portion of the root. A post has a first end portion which extends into the hollow of the root and is fixed to the root. A second portion of the post extends outwardly from the hollow and has an outer surface which slopes downwardly toward the first portion of the post. A crown is connected to the second portion of the post.

Brief Summary Text - BSTX (2):

The present invention relates to a novel osseointerfaced implanted artificial tooth which provides a permanent replacement for a natural tooth. In the past, many systems have been proposed for the implantation of artificial teeth. For example, diverse designs with screws, nails, blades, and the like which are loaded immediately upon insertion in the jaw **bone**. These implants generally result in scar formation around the implant with insufficient gingival seal, causing chronic infection, **bone** loss, and the eventual removal of the implant itself. For example, U.S. Pat. Nos. 2,857,670 and 3,579,831 describe these systems.

Brief Summary Text - BSTX (6):

In accordance with the present invention, a novel and useful osseointerfaced

implant system is described which may be permanently affixed to the jaw **bone** is
provided.

Brief Summary Text - BSTX (7):

An artificial tooth of the present invention is implantable in the jaw **bone**
(alveolar) and employs an implantable tooth root. The tooth root has a distal
end portion extending into the jaw **bone** and a proximal end portion being
accessible from the outer surface of the jaw **bone**. The root further includes a
hollow extending from the proximal end portion of the root toward the distal
end portion of the root. The root may include means for tapping, or self
tapping the same in relation to the jaw **bone** during placement. Means is also
provided for fixing the root to the jaw **bone,** such as a threaded surface. The
hollow of the tooth root provides a place of fixation for the remainder of the
artificial tooth. A post threads or otherwise fixes to the hollow of the tooth
root and extends upwardly away from the jaw **bone**. The hollow may be sealed
during a healing period to further strengthen the tooth root, and to maintain
an unobstructed place of fixation for the post. The post may have a first
portion fitting within the hollow of the root and a second portion extending
outwardly from the hollow. The post second portion may also embrace an outer
surface which slopes downwardly toward the first portion of the post, and
inwardly toward the center of the post. This so called obtuse angle provides a
tight contact between the gingiva and the implant and protects this contact as
well.

Brief Summary Text - BSTX (8):

A crown is then connected to the post, specifically the second portion of
the post extending outwardly from the hollow of the tooth root. The second
portion of the post may also be formed such that a base connects to the first

portion of the post and a stem extends from the base of the second portion of the post. Means may also be provided for breakably connecting the base to the stem of the second portion of the post. In this manner, excessive lateral forces would shear the post rather than traumatizing the implant or the jaw **bone** itself.

Brief Summary Text - BSTX (9):

To limit the elasticity of the upper structure, the second portion of the post may be coated with a polymer which would lie between the crown and the post. The polymer acts as a shock absorber and protects the **bone** against sudden high stress. Moreover, the polymer, or plastic coating, must have an elasticity which would limit mobility of the implant system; thus precluding damage to the **bone** around the natural teeth.

Brief Summary Text - BSTX (13):

It may be apparent that a novel and useful artificial tooth implantable in the jaw **bone** has been described. It is therefore an object of the present invention to provide an artificial tooth implantable in a jaw **bone** which provides satisfactory service over a long term.

Brief Summary Text - BSTX (14):

It is another object of the present invention to provide an artificial tooth implantable in a jaw **bone** which closely resembles the mobility of the natural tooth, thus permitting the patient to chew in a normal manner and protect against parafunctional forces.

Brief Summary Text - BSTX (15):

It is yet another object of the present invention to provide an artificial tooth implantable in a jaw **bone** which may be used in substitution for a single tooth or a group of teeth as well as being connectable to natural teeth.

Brief Summary Text - BSTX (16):

Still another object of the present invention is to provide an artificial tooth implantable in a jaw **bone** which protects against food particles being wedged between the gingiva and the implant during the chewing process, and against traumatizing of the contact site between the gingiva and implant.

Brief Summary Text - BSTX (17):

Yet another object of the present invention is to provide an artificial tooth implantable in a jaw **bone** which has a predetermined breakage point of a portion thereof, upon the application of a predetermined shear force, thus protecting the implant and/or the jaw **bone** itself.

Brief Summary Text - BSTX (18):

Another object of the present invention is to provide an artificial tooth implantable in the jaw **bone** which utilizes a post having a removable section which permits the dental practitioner to adjust the height of the post in relation to the tooth root.

Detailed Description Text - DETX (3):

Root 12 may be constructed of a relatively rigid biocompatable material. For example, titanium would be a satisfactory material under this criteria. Root 12 is roughly cylindrical in shape and possesses a threaded surface 14. Root 12 may also include a self tapping construction, FIG. 1 broken away portion, of known construction. Root 12 includes a hollow portion 18 which extends from the upper surface 20 of root 12 toward the lower surface 22 thereof. Thus, proximal end portion 24 of root 12 extends to the outer surface of jaw **bone** 26. Distal end portion 28 of root 12 extends into the jaw **bone** 26 as far as is necessary for a satisfactory implantation. Threaded surface 14 of root 12 threadingly engages the threaded surface of jaw **bone,** FIG. 1C, 26 created by self tapping means 16. Thus, this threading engagement may be

considered means 30 for fixing root 12 to jaw **bone** 26. Slot 32 permits the
user to use a driving means to turn root 12 during the tapping of jaw **bone** 26.
It should be noted that a screw 34 is temporarily placed in hollow proportion
18 and is held in place by the threaded surface 36 of screw 34 engaging
threaded surface 38 of root 12 within hollow portion 18. Turning to FIG. 1A,
it may be seen that screw 34 is temporarily inserted into hollow 18 during
first stage of the implant which will be further described hereinafter.

Detailed Description Text - DETX (4):
Post 44 includes a first portion 46 which fits within hollow 18 of root 12.
A second portion 48 extends outwardly from hollow 18 and upwardly from the
surface of jaw **bone** 26. Second portion 48 includes an outer surface 50 which
slopes downwardly toward first portion 46 of post 44 and inwardly toward the
center of post 44. This permits the tight fitting of gingiva 52 to the outer
surface 50. The sloping surface 50 also acts as a shelter against food
particles wedging between surface 50 and gingiva 52. It should be added that
the prevention of food particles from entering the space between the gingiva
and the outer surface 50 of the post prevents damage to the implant and the
living tissue thereat. Means 54 fixes first portion 46 of post 44 within
hollow 18 of root 12. Such means may take the form of providing first portion
46 of post 44 with a threaded surface 56 which engages threaded surface 38 of
hollow 18. It may be apparent that threaded surface 36 of screw 34 previously
engaged the same threaded surface 38 of hollow 18, FIG. 1B. Post 44 may again
be constructed of a fairly rigid material such as titanium. Second portion 48
of post 44 may include a base 58 connected to first portion 46 of post 44.
Stem 60 extends from base 58 upwardly from jaw **bone** 26. As shown in the

embodiment in FIG. 1, stem 60 is narrower transversely than base 58. Means 62
breakably connects base 58 to stem 60. In other words, second portion 48 of
post 44 includes a weakened undercut portion 64 which surrounds the connection
area between base 58 and stem 60. Thus, any excess lateral or shear forces
will cause the breakage of stem 60 in relation to base 58 and thereby protect
root 12 in **bone** 26. Undercut portion 64 is filled with a glue 66 which also
surrounds stem 60. Glue 66 is used to attach a layer of resilient material 68
such as silicone, polysulphone, and the like. The thickness in quality of
resilient layer 68 may be predetermined to restrict the range of movement of
the upper structure to about 200 microns. Resilient layer 68 also acts as a
shock absorber to protect the **bone** 26 against sudden high stress. Finally, a
crown 70 may be formed as shown in FIG. 1.

Detailed Description Text - DETX (7):

In operation the jaw **bone** 26 is made visible to the dental practitioner by
the use of a surgical device. Root 12 is tapped into place using tapping means
16 such that upper surface 20 of root 12 is accessible at the outer surface of
bone 26. The drills used to locate the root opening are **cooled** to protect the
bone against burning during this process. **Screw 34 is inserted** into hollow 18
of root 12 and covered by gingiva 52 for approximately four months. After this
time period **pilot hole** 42 permits the dental practitioner to locate screw 34
through the gingiva 52 covering screw 34. A special cutting instrument removes
the overlying tissue to reveal screw 34. Screw 34 is then removed and post 44
or spline 72 and spacer 74 are inserted within hollow 18 of root 12. It should
be apparent that the superstructure consisting of the crown and resilient layer
68 could be attached to post 44 or spline 72 and spacer 74 after fixation of
the post 44 or spline and spacer 72 and 74 to root 12. Resilient

layer 68 will
separate under pressure, such as the pressure applied by a plier-like device.
Separation of resilient layer 68 from post 44 permits the dental practitioner
to inspect, and/or alter the superstructure of the implant system. Post 44
would also be removable from root 12. As heretofore described, spacer 74 may
be replaced with a spacer of a different height. Upper portion 84 of spline 72
may be cut down to provide for the insertion of a denture. Thus, all portions
of the artificial tooth are replaceable, except the root 12.

Claims Text - CLTX (1):
1. An artificial tooth implantable in a jaw **bone** comprising:

Claims Text - CLTX (2):
a. an implantable tooth root, said root having a distal end portion intended
for extending into the jaw **bone** and a proximal end portion being accessible
from the outer surface of the jaw **bone**; said root further including a hollow
extending from said proximal end portion of said root toward said distal end
portion of said root;

Claims Text - CLTX (3):
b. means for fixing said root to the jaw **bone**;

Claims Text - CLTX (13):
8. The artificial tooth of claim 7 in which said root includes means for
tapping said root in relation to the jaw **bone** during placement of said root in
the jaw **bone**.

Scholar **All articles - Recent articles** Results **31** - **40** of about **6,000** for **bone drilling coolant fasten**

[CITATION] Principles of Rigid Bony Fixation of the Craniofacial Skeleton
HG Luhr - Mastery of Plastic and Reconstructive Surgery, 1994 - Little Brown and Company
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MAG BETTLACH - haukeland.no
... 5). To hold the **bone** temperature as low as possible, **cooling** the **bone** and the ... the AO/ASIF Large Hexagonal Screwdriver Shaft 314.15 for the small air **drill**. ...
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[CITATION] REMOVAL TORQUES OF **SCREW**-SHAPED CP TITANIUM AND TI 6A1 4V IMPLANTS IN RABBIT **BONE**.
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P Tibia - products.synthes.com
... dense or thick cortical **bone** before placement ... a 5.0 mm locking **screw** to prevent **screw drilling** flutes from ... described on page 29, "Irrigation and **Cooling**"). ...
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Osseointegration of **bone** implants: a review of an alternative mode of fixation
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▶ A new modality of treatment for non-united fracture of the humerus in a patient with osteopetrosis: ...
I Rafiq, A Kapoor, DJC Burton, JF Haines - Journal of Medical Case Reports, 2009 - pubmedcentral.nih.gov
... high speed electric **drill** bits, frequently **cooling** them and ... **drill** bit system to overcome **drill** breakage and ... this complication by using **Bone** Morphogenic Protein ...
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Increase of stability in external fracture fixation by hydroxyapatite-coated **bone** screws
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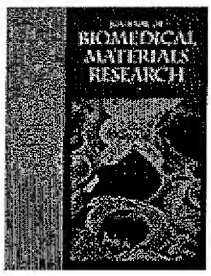

Journal of Applied Biomaterials

See Also:
Journal of Biomedical Materials Research Part B: Applied Biomaterials

Volume 6 Issue 2, Pages 99 - 104

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Original Report and Review

Increase of stability in external fracture fixation by hydroxyapatite-coated bone screws

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ABSTRACT

A major problem in fracture treatment by external fixation is screw loosening, which often results in reduced stability and can lead to prolonged treatment. A load-carrying experiment was conducted to determine whether coating implants with bioactive hyroxyapatite (HA) increases screw stability. Twelve HA-coated ASIF screws with 3 different macroporosities were inserted in 12 sheep that had already been fitted with a 6-pin external fixator for the treatment of a tibial osteotomy. The same number of uncoated polished steel screws served as controls. Although initial stability was not different for HA-coated screws, average removal torque after a 9-week implantation period increased with increasing macroporosity of the HA coating (p <.002). Instability of some screws was accompanied by histologic findings of cartilagenous tissue and proliferation of periosteal callus. Near the threads in the tibial cortex and in the shaft area of the screw were seen large numbers of HA particles that had been sheared off during implantation as well as during screw removal because of high contract forces between the HA coating and bone. Particulate debris of HA particles as well as the release of small bone fragments during explantation is likely to be unavoidable since HA adherence to bone is greater than adherence to steel after several weeks of implantation. © 1995 John Wiley & Sons, Inc.

DIGITAL OBJECT IDENTIFIER (DOI)

10.1002/jab.770060203 About DOI

RESULT LIST
1 result found in the Worldwide database for:
drill? cool* fastener? bone in the title or abstract
(Results are sorted by date of upload in database)

1 **Drill guide for mandibular staple transosseous implants**

Inventor: KNAPP JOHN G [US]
Applicant: KNAPP JOHN G [US]
EC: A61C1/08F1
IPC: ***A61C1/08;*** **A61C1/08;** (IPC1-7): A61C8/00
Publication info: **EP0774238 (A1)** — 1997-05-21

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(11) EP 0 774 238 A1

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21.05.1997 Bulletin 1997/21

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AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

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(54) Drill guide for mandibular staple transosseous implants

(57) A drill guide for mandibular staples is disclosed which is adapted to accurately align a drill for drilling fastener holes in the mandibular lower jaw portion at precisely located positions for the attachment of fasteners therethrough by means of a staple to retain a dental appliance in secure position on the mandibular jaw portion. The drill guide improves upon previously known means of ensuring accuracy of drilling holes, attachment and locking means, adjustability of the invention, cooling and cleaning means, and assuring adequate bone material for drilling.

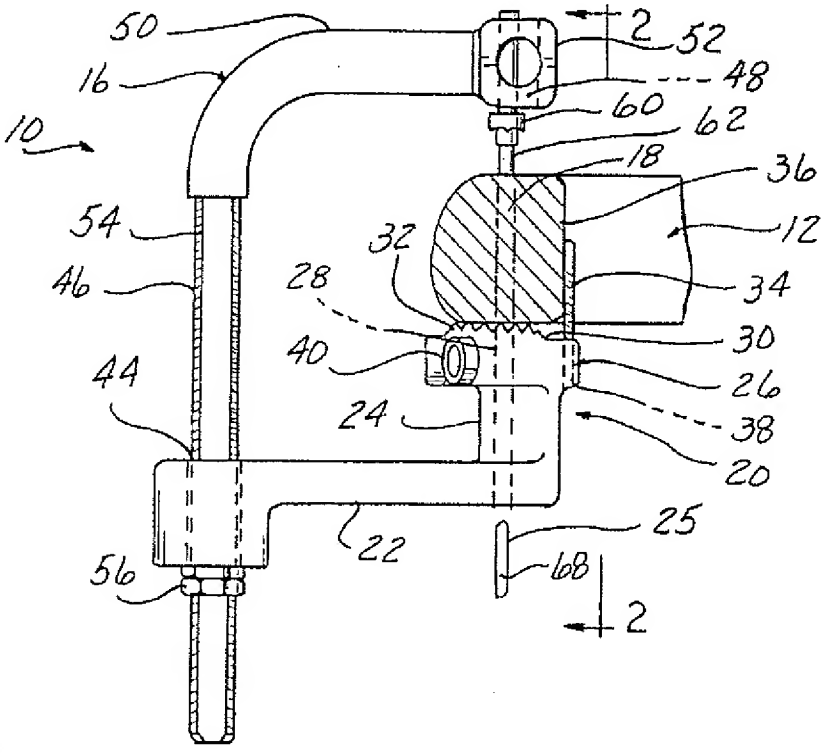

FIG - 1

EP 0 774 238 A1

Description

The present invention relates to a drill guide for mandibular staple transosseous implants and specifically for controlling the accuracy of drilling positions and assuring adequate bone material for drilling. The drill guide provides an accurate means for guiding the drilling of apertures through a mandibular jaw bone, be it human or animal, in which apertures at accurately spaced points are adapted to receive a mandibular staple transosseous implant provided with fastening means thereon to securely engage the jaw bone and to provide an interlock with the dental appliance normally, removably mounted on the jaw bone.

Heretofore, in the use of dental appliances of a removable nature, particularly with reference to the lower mandibular jaw, natural suction of the dental appliance or cohesion is often reduced due to the aging and wasting away of jaw bone tissue. Various means are known to be employed in an effort to retain and anchor the lower removable dental appliance against accidental dislodgement from the jaw bone. Since the use of adhesives or known mechanical devices heretofore have been ineffective and inefficient for the intended purpose, a mandibular staple, such as disclosed in U.S. Patent No. 4,906,189, has been developed for securing dental appliances to the jaw. However, the known means used in securing the mandibular staple lacks the accuracy desired in drilling the holes in the jaw bone for placement of the mandibular staple.

In the prior art patents (U.S.Patent No. 3,414,975 and U.S.Patent No. 3,664,022), a drill fixture or guide is provided in which a drill is guided through apertures through the jaw bone to allow placement of a mandibular staple. Patent number 3,664,022 improved upon the accuracy of the drill guide patent number 3,414,975 by providing an apertured curvulinear abutment and spaced guide pins which are free to accommodate for unevenness in the jaw bone. However, these drill guides do not provide means for controlling the accuracy of the direction of the drill or ensuring that there will be adequate bone material for the drilling procedure and placing the staple.

The prior art disclosed in Pat. No. 3,664,022, also improved prior drill guides by allowing space on one side of the drill by providing a central slot that allows bone matter to escape. However, one wall of the drilling apertures is closed, and although somewhat relieved, clogging is still a concern.

The prior art does not disclose any means for cooling and cleaning of the dull guide apertures.

The present invention consists of an improved drilling guide which has a set of guide pins that extend upwardly from the drill guide portion and rest against the inner edge of the jaw bone. The guide pins act as a visual indicator of the distance between the guide pin and the center line of the drill guide aperture control the accuracy of the drill ending point. The set distances from the center line of the drill to the guide pins, and from the drill centerline to the support rod allow the user to simply attach the drill guide to the jaw bone, and since the guide pins rest against the inside surface of the jaw bone, the user is assured adequate lateral bone material when drilling.

The improved invention also provides a simple means for attaching and locking the drill assembly to the jaw bone, consisting of a square shaped threaded support rod that is adapted to fit into a correspondingly square shaped opening of a lower arm on which the drill guide is located. The square shape of the support rod prevents the support rod from rotating, thus maintaining the lower arm member and the drill guide portion properly aligned and securely positioned. A lock nut is threadingly engaged onto the support rod allowing the user to move the lower arm member upward and downward along the support rod to the desired position and to lock the lower arm member in place while preventing relative rotation of the lower arm member and support rod.

The present invention improves upon the cleaning and cooling of the drill guide portion during the drilling operation. The drill guide portion contains ports connected to the drilling guide bores, or apertures, allowing coolant (i.e. water) to flow into the drill bores, cooling and cleaning the drilled area.

Another improvement concerns the recessed portion of the drill guide portion member that laterally intersects the apertures. In the present improved invention, a lateral slot surrounds the apertures permitting bone substances removed through the drilling operation through the jaw bone to be expelled outwardly on all sides of the drill to prevent clogging of said apertures.

It is therefore an object of the present invention to provide a means that allows improved accuracy of drilling holes needed to secure the mandibular staple to the mandibular jaw bone beneath the subcutaneous tissue.

Other objects, advantages and applications of the present invention will become apparent to those skilled in the art of drilling guides when the following description of the best mode contemplated for practicing the invention is read in conjunction with the accompanying drawings.

The description herein makes reference to the accompanying drawings wherein like reference numerals refer to like parts throughout the several views, and wherein:

Figure 1 is a side elevational view of the present improved mandibular drill guide illustrated in attached drilling position on the curvulinear front end of the mandibular jaw bone;

Figure 2 is a rear view of the present improved invention in attached drilling position with the jaw bone in phantom as seen from line 2-2 in Figure 1;

Figure 3 is a top plane view of the lower arm and drill guide of the present improved invention, with

the gripping teeth removed for clarity;
Figure 4 is a cross sectional view of the drill guide taken along line 4-4 of Figure 3;
Figure 5 is a cross sectional side view of the drill guide taken along line 5-5 in Figure 3; and
Figure 6 is a top plane view of the gripping teeth on the drill guide.

Referring now to the drawings, and in particular to Figure 1, where the present invention is illustrated, as a drill guide assembly 10 attached to a mandibular jaw bone 12 which could be either human or animal. The drill guide assembly 10 comprises a drill guide member 20 and a drill guide clamp 16. The drill guide assembly 10 allows accurate drilling of bores or holes 18 in the jaw bone 12 to effect the placement of a mandibular staple (not shown) such as shown in patent number 4,906,189 which is incorporated by reference.

For this purpose, the drill guide member 20 has an elongated arm member 22 which supports the drill guide member 20. The drill guide member 20 contains a recess 24 and a top portion 26. Drill guide member 20 is curvulinear in shape and is provided with a plurality of apertures 28. The apertures 28 in the drill guide member 20 are adapted to guidingly receive drills of different sizes for drilling bores 18 in the mandibular jaw bone 12 for attachment of the staple and thus corresponding in the spacing and number to the spacing and number of locking pins and fastener rods of the mandibular staple (not shown).

This curvulinear shape of the drill guide member 20 corresponds to the curvulinear shape of the support plate of the staple. As seen in Figure 5, the drill guide member recess 24 completely intersects the apertures 28 to provide a lateral opening on all sides of the apertures 28. When drilling through the apertures 28, the drill 25 (shown in phantom line in Figure 5) is free on all sides with respect to the aperture 20, thereby permitting powdered bone material and bone chips to be expelled during the drilling operation and not accumulate and/or clog the apertures 28.

The upper surface 30 of the top portion 26 of the drill guide member 20 is provided with rows of upwardly protruding gripping teeth 32 extending along the opposed outer edges of the top portion 26. The drill guide assembly 10 is adapted so that the gripping teeth 32 of the top portion 26 bite into the lower surface of the jaw bone 12, upon respective adjustment of the drill guide member 20, described further herein.

As shown in Figures 1 and 2, the top portion 26 of the drill guide member 20 is also provided with a set of guide pins 34, which extend upwardly from the top portion 26 into the space adjacent the rear facing surface of the jaw bone 12, resting on the surface of the jaw bone material 36. The guide pins 34 are placed in pin holes 38 in the top portion 26 of the drill guide member 20. Several sets of pin holes 38 are present to allow adjustable locations of entry for the guide pins 34 to adapt to different sizes of jaw bones. The guide pins 34 are also threaded to allow adjustment upwards and downwards through the pin holes 38. The purpose of the guide pins 34 as explained herein after.

As shown in Figures 4 and 5, the top portion 26 of the drill guide member 20 further contains port holes 40. Each of the port holes 40 are connected to the apertures 28 by a passageways 42, which are interconnected, as shown in Figures 3. The port holes 40 allow passage of a cooling or cleaning fluid, such as water, through the passageways 42 to the apertures 28. Therefore, the ports 40 provide a means to cool the apertures 28 shortly after or during the drilling of the drill holes 18 in the jaw bone 12. Further, the port holes 40 provides a means to clean the apertures 28 by allowing a cleaning solution to rinse the apertures 28 after or during the drilling of the hole 18 through the jaw bone 12, and thus flushing out material through the port hole 40 as well as through the recess 24 of the drill guide member 20.

Referring now to Figures 1 and 3, the elongated arm member 22 of the drill guide member 20 has a square shaped opening 44 which corresponds in size and shape to receive the support rod member 46 of the drill guide clamp 16, thereby connecting the drill guide member 20 and the drill guide clamp 16.

The drill guide clamp 16 consists of a support rod member 46 and an upper arm member 50 containing a yoke member 52 thereupon. The support rod member 46 is threaded 54 and square in shape so as to fittingly correspond with the opening 44 of the elongated arm member 22 of the drill guide member 20. A pair of nuts 56 are threadingly engaged to the support rod member 46 beneath the opening 44. The nuts 56 can be turned around the threading 54 of the support rod member 46 to permit movement of the drill guide member 20 upwards or downwards along the support rod member 46, the nuts 56 also acting as a lock when the drill guide member 20 is set in the desired position. Also, since the support rod member 46 is designed in a square shape that fits through the corresponding square opening 44 of the elongated arm member 22, it cannot rotate once the drill guide member 20 is set in its desired position by the nuts 56.

The front end of the upper arm member 50 supports a yoke member 52 which extends transversely of the arm 50 to both sides thereof. Both outer ends 58 and 59 of the yoke member are formed cylindrically and each supports a locator pin 60 for extension downward toward the drill guide member 20. The locator pins 60 are yieldably supported for relative longitudinal up or down movement by a common pivot for reciprocating movement in opposite directions, and are located at opposite ends of the yoke member 52. This movement of the locator pins 60 is provided to accommodate for unevenness in the jaw bone thickness. The yolk member 52 allows lateral adjustment of the locator pins by providing a choice of placement holes 48 in which to place the locator pins to adjust to different jaw sizes. The lower

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(54) Cutter for enabling to form a precision frustoconical hole in bones.

(57) The precision hole (40) is obtained by using a cutter (100) in the shape of an inverted "wedding cake", then reaming the obtained cavity with a manual reamer (140), and tapping said hole with a tapper (60;100), and screwing the screw (10;80) into it.

In the tappered precision hole (40) is then inserted a screw device (10;80) for fixing prostheses to bones. The screw has a threaded shank (14) comprising a core (32,34) of overall frustoconical shape, and a cylindrical neck (12) of diameter equal to or greater than the maximum diameter of the thread.

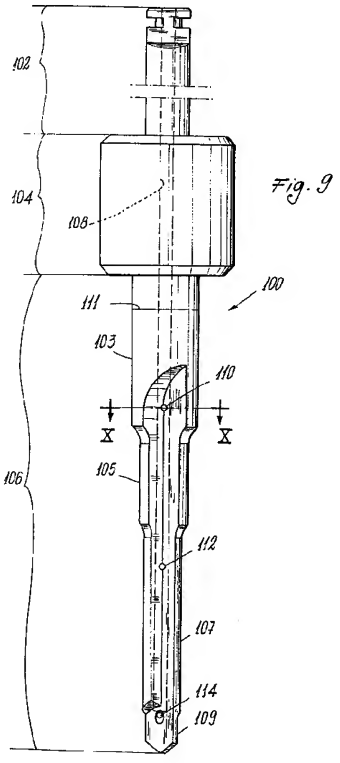

Fig. 9

EP 0 557 899 A1

This invention relates to a cutter for enabling to form a hole in bones.

As is well known, in terms of mechanical characteristics bone tissue can be divided into two distinct regions, namely the cortical bone region with an elastic modulus of between 1000 and 1200 dN/mm^2 and the spongy region, of trabecular bone tissue containing medulla or fat, with all elastic modulus of roughly between 20 and 400 dN/mm^2.

Currently, to execute an implant in any bone, use is made of known bone screws which have a substantially cylindrical shank and are constructed of a biocompatible metal such as titanium, austenitic stainless steel, tantalum, niobium or zirconium. These screws require a cylindrical hole to be previously drilled in the bone.

If the screws are of the self-tapping type they are inserted directly into the cavity thus obtained, which always has a diameter less or at most equal to the core of the screw. In the case of non self-tapping screws the relative female thread has to be formed in the side surface of the hole.

For fixing purposes, known screws utilize either the mechanical characteristics of the trabecula and therefore have a thread of rather large pitch, of the type suitable for fairly soft materials, or the mechanical characteristics of the cortical bone opposite the point of penetration of the screw, which has a thread pitch significantly less than in the previous case and suitable for ensuring a good mechanical grip in hard materials, but not suitable for gripping the trabecular bone tissue.

In its turn, because of its thinness the cortical region of the bone can generally only receive one large-pitch turn. In addition, because of its relative fragility the cortical bone tissue is unsuitable for receiving a large-pitch thread.

This applies particularly to the cortical bone located on the same side as that from which the self-tapping screw or thread tapper is inserted. In this respect, as stated the thread of the screw or tapper has a diameter greater than that of tile drilled hole. In addition the screw neck (ie the cylindrical end of the screw to which the prosthesis is fixed, and which is normally not threaded but enters the cortical bone) has a diameter less than that of the thread. As a result, on inserting the self-tapping screw or tapper into the drilled hole the most outer part, ie the cortical bone, of the bone tissue is removed. Consequently, once the screw has been inserted into the bone, an empty annular space remains around the screw neck. This means that the cortical bone is surgically damaged for a certain area around the screw neck. The damage is directly proportional to the size of the tooth of the thread on the self-tapping screw or tapper. That part of the cortical bone which has been thus removed does not form again.

This represents a serious drawback as the cortical bone is the strongest region of the bone and the most suitable for supporting loads, particularly loads perpendicular to the screw axis.

The cavity for receiving the screw is formed by rotary tools mounted on hand-controlled drills.

The shape and dimensions of the cavity obtained depend on various factors, and in particular:

a) the bone to be drilled;

b) the drilling tool;

c) the operator holding the drilling tool.

The causes influencing these three factors will be examined in detail:

a) The bone to be drilled cannot be fixed rigidly, with the result that there is a certain freedom of movement. It also has a smooth, moist and therefore slippery surface. In addition the surface is somewhat round. Again, the structure is anisotropic so that the resistance offered to the tool cutting edge varies as drilling proceeds.

b) The drilling system comprises a drill bit or cutter of various shapes, such as a spade tip with a solid cylindrical body, a flared tip with a vertically grooved body to collect shavings, or a flared tip with a helically grooved body to collect shavings.

No studies appear to have been carried out with the purpose of determining the best cutting angle for the bone, or conceiving a good system for discharging the bone shavings which mix with the blood and tend to coagulate. As is well known, when the drill bit is fitted into the drill it is retained by a quick-action mechanism consisting of a hollow neck which receives the relative part of the bit, which is thus locked in terms of axial movement, whereas the bit has a certain radial play. Consequently the bit does not rotate about a fixed axis but about an axis which can undergo small oscillations and movements perpendicular to itself.

The mechanism which transmits movement to the drill bit can also move slightly because of intrinsic mechanical play within the mechanism. The combination of all these causes means that the drill bit undergoes a complex "wobbling" movement.

c) The hand of the operator gripping the drill is subject to muscular control, which varies from operator to operator and can also vary with time for the same operator.

From the aforegoing, and considering any cross-section through a drill bit when freely rotating, before it makes contact with the bone it describes a peripheral or enveloping circle which has a diameter greater than the true diameter of the bit at that cross-section, because of the effect of said wobbling.

Moreover when the tip of the drill bit comes into contact with the bone, no matter how expert or attentive the operator is, the bit axis is generally not exactly perpendicular to the bone surface.

Consequently, even if a starter cavity is present (previously made in the bone surface), when the operator exerts a certain pressure on the bit to drill the hole, a non-axial reaction is applied to the bit, which consists of one component perpendicular to the bit axis to flex it, and a second component along the bit axis. Said flexing force has two effects, the first being the nullifying of the radial play of the mechanism which holds the bit so that said peripheral circle becomes the maximum possible, the second effect arising when play has been nullified, to deform the bit by flexure, so further increasing the diameter of the peripheral circle.

When the drill bit has initially entered the bone a cavity of previously indeterminable diameter results, this diameter being in any event certainly greater than that of the corresponding cross-section of the bit. This cavity will have a certain depth, say one or two millimetres.

It is therefore apparent that the amount of play varies in practice and cannot be controlled, and it can only be stated that the drill bit will advance through this first section in a merely "prevalent" direction, being substantially that of the theoretical axis of the bit. It is however apparent from the aforegoing that the inaccuracy will be somewhat high.

In practice, in its initial portion the cavity can be considered to consist of a series of probably irregular superposed circles of variable diameter, slightly mutually off-centre, to form a cavity extending prevalently in a certain direction.

When further pressure is applied to the drill bit it advances through the bone. Two new substantial factors now come into play to influence the operation, namely the accumulation of shavings which tend to coagulate, and the presence of that part of the cavity which has already been drilled.

The presence of shavings increases friction, to generate heat and result in further small removals of bone material from the cavity walls. The friction can increase to the extent of stopping the drill motor.

The shavings must therefore be removed whatever type of drill bit is used. This is firstly to prevent the bit heating, and secondly to allow it to move forward. They are removed by extracting the bit from the hole. Each time this is done new material is inevitably removed from the walls of the already drilled hole.

That part of the hole which has already been drilled performs the important function of guiding the cylindrical body of the bit. In bits with a helical groove this body has a cutting or partly cutting effect, whereas in bits without a groove or with a vertical groove it does not cut.

If the bit body has a cutting or partly cutting effect each change in the bit direction results in a removal of material. The cavity therefore widens, so reducing its guide function. As stated, on termination of the operation the cavity is found to be formed from a series of superimposed circles of a diameter which varies within a certain range and slightly off centre to each other, to form a cavity which is therefore somewhat irregular. Of necessity the cavity will have a diameter which is greatest at its open end and smallest at its other end.

If the bit body does not have a cutting effect, the guiding efficiency of the already drilled cavity increases with increasing depth. However this does not mean that greater accuracy is obtained in drilling the cavity. In fact all the reasons which make the initial cavity wider than required (from the wobbling of the drill bit to the non-perpendicularity between the bit and the surface of the bone) remain. In fact, a further drawback arises, and one which helically bodied bits do not possess, namely that drill bits with a cylindrical lateral surface do not have space for discharging the shavings. The bit must therefore be extracted much more frequently to clean it, this finally resulting in further widening of the cavity. The bit penetration movement is in reality helical in the direction of rotation of the drill, this movement being a combination of advancement and rotation.

Thus on termination of an in-vivo bone drilling operation conducted by normal surgical methods, the result is an approximately frusto-conical cavity of unknown diameters but certainly greater than the diameters of the drill bit used.

From tests carried out it has been found that this increase is in the order of some tenths of a millimetre, with wide variation.

To make an initial approximate guess at the type of cavity obtained, one must think of a pile of discs with diameters gradually increasing upwards and decreasing towards the lower end.

The discs will be slightly off-centre to each other and their centres will approximately form an irregular helical pattern. If an ideal axis is imagined passing through the centres of the two end discs, the centres of the intermediate discs will not generally lie on this axis but will lie within a certain helix about it.

If a circle is drawn having the nominal diameter of the screw (having an overall cylindrical shape) and centered on said axis, and then on this circle a further circle is drawn having the measured diameter of a certain cross-section of the cavity obtained and with its centre in its true position eccentric to the axis, the points of contact, if there are

any, and the maximum distances between the two circles can be seen. If this operation is repeated for a certain number of cross-sections the number of points of contact between the screw and cavity can be determined accurately, as can the size of the non-adhering regions and their distance from the screw. This also clarifies why even with an effective diameter which is constantly greater than the nominal diameter of the drill bit there can only be a number of points of contact distributed randomly over the surface of the cavity.

If in order to verify this a drill bit is inserted into the cavity obtained, the bit may appear stable if by chance it touches the walls at a few points, but these do not ensure effective stability. What however normally happens is that the drill bit has a certain play when inserted into the cavity, showing that there is an insufficient number of points of contact.

Consequently when the cavity is finally tapped, the resultant thread will be complete in terms of depth only at the said points of contact, whereas the remainder of the thread will be only partial or indeed be completely lacking.

This however does not mean that sufficient information is available to ensure healing, given that it is not known how and in particular when the bone will reform.

The question arises as to whether it is possible to adapt operational technology in such a manner as to obtain cavities with a precision of the order of that obtainable in the machining of the actual implants to be inserted into the cavity. The present invention shows that this is possible. In this respect it teaches that such levels of precision can be in reality obtained without having to use too complicated and very costly procedures. In this respect, with the present invention precision levels of 0.02 mm as general dimensional tolerance can be obtained, while for a series of reasons which have already been stated a precision of 0.01 mm can be obtained for surface irregularities, which can be considered optimal.

The reason for this search for precision is to reduce as much as possible, and in the theoretical limit to zero, the quantity of bone tissue which has to reform about the implant.

The problem of play between the drill bit and chuck and the intrinsic play within the drill head can only be solved by completely changing current technology. This however would result in very high cost.

It has been seen that any movement of the screw relative to the walls of the cavity which receives it has a negative effect on the repair of the bone lesion.

The object must therefore be to obtain a connection in which such relative movement is not possible. This need is currently satisfied by using a more or less forced insertion of the implant into the cavity. The bone tissue in contact with the implant is therefore compressed. This compression is the price paid by all known insertion methods which provide initial immobility of the implant. The blades or cylinders currently used for this purpose are in fact inserted with small hammer blows. In this manner a forced fit is obtained between the bone and implant by virtue of the mutual compression between certain regions of the implant and the corresponding regions of the cellular wall.

Implants formed from different elements (disk implants) utilize the traction between screw elements and prismatic bodies to obtain bone-implant adhesion areas which provide the necessary initial stability.

The screw has encountered considerable success because it enables an excellent and immediate rigid connection to be easily obtained between the implant and bone. This method has however certain negative aspects due to two basic reasons, namely the trauma (COMPRESSION) produced by the helical thread in the tissue, and the transmission to the bone, via the thread, of loads perpendicular to the screw axis.

Attempts have been made to solve both these problems by eliminating the thread and proposing cylindrically shaped implants, but these demonstrate poor initial stability (PRIMARY), require larger holes to be made, require higher bone crests and provide a lesser lateral surface for equal dimensions.

In reality the solution to the problem does not consist of attaining a stability which allows any level of bone repair, but consists of establishing best bone conditions for healing.

The best healing conditions are obtained by satisfying two general conditions:

1. Reducing surgical trauma to a minimum and eliminating debris.
2. Attaining maximum initial congruence with minimum pressure.

These two conditions result in an improvement in the progress of the reparative process, which normally involves:

1) Resorption of certain bone tissue;
2) Reshaping of other bone tissue;
3) Bone tissue neoformation.

The reduction in surgical trauma limits the necrosis of the tissue of the cellular implant wall; the elimination of debris avoids compression, resorption and infection. The fact of obtaining maximum congruence with minimum pressure results in primary stability, no bone resorption stage, no bone to be neoformed in the cortical bone part and little in the spongy part.

The female thread is currently made in the bone by two substantially different methods, namely by partial mechanical tapping (as in the Branemark method), and by self-tapping screws (as in the case of Tramonte screws).

Partial mechanical tapping involves the insertion of self-tapping screws which traumatize the bone and retain all the debris. This means that with Branemark screws the bone in contact is quickly resorbed and congruence is lost. The reparative process takes place by callus formation.

Self-tapping screws of Tramonte type allow maximum congruence between the thread and bone, but involve a forced compressive insertion which causes serious damage.

The insertion of either a self-tapping screw or a tapper into the drilled cavity causes both local and general effects in the bone, as follows:

I - Local effects

These are caused by the following actions:

a) Cutting action

The cutting action of the thread separates the bone tissue, damaging the calcified bone matrix, the collagen, the basic substance, the cells, the vessels and the nerves. At the commencement of the tapping operation and in the case of the self-tapping screw the cutting action causes inflammation and loss of blood. The tissue lesion results in the release of inflammatory substances (H.W. HAM - Istologia, USES 1969).

b) Compression action at interface

As the tapping or the insertion of the self-tapping screw continues, the tissue is divaricated by the thread. On commencement of tapping or insertion of the self-tapping screw, if there is no counteracting element in contact with the bone surface breakage occurs by raising of the cortical bone surface, with consequent disruption of the architecture in the surrounding region. In particular, it is the tearing of the vascular connections which seriously prejudice the bone reparative process in this region. In the compagination of the tissue, the divarication necessary for the advancing movement of the thread is obtained by compression of the tissue at the interface. Under the advancement thrust the bone tissue volume corresponding to the volume of the tapper thread or of the thread of the self-tapping screw is fractured and pushed to the sides of the advancing thread. As the spongy trabecular bone tissue lies below the cortical bone, its disturbed solid part, formed of calcium salts, fills the entire available surrounding space, squeezing the vessels contained in the medulla and reducing the blood flow, with consequent ischemia, whereas its liquid part is thrust into the most peripheral trabecular region.

If the thread has a pitch which results in superposing in the spongy bone tissue regions, which then become compressed by two successive turns of the thread, a particularly negative situation arises due to the combining of harmful effects which complicate healing. In determining the pitch of the thread of self-tapping screws or of the tapper, the size of the relative core and the size of the cavity to drill in the bone, this important aspect must be taken into account.

c) Action of heat

It is well known that the heat developed in the bone during the drilling of the hole into which the self-tapping screw or tapper is to be inserted is the main cause of formation of cicatricial fibrous connective tissue, rather than new bone tissue, in the subsequent reparative process which the surgical lesion undergoes.

For this reason, in drilling said hole it is advisable to use known rotary instruments internally cooled by physiological solution which in addition to cooling the drill bit also removes the bone shavings by collecting them in the grooves provided.

Another method for reducing the heat produced is to limit the rotational speed of the drill to the minimum rpm which allows the hole to be drilled.

Likewise the tapping operation or the insertion of the self-tapping screw must also be very slow, so that all phenomena arising can be considered of static type, and the applied forces must be only just greater than equilibrium forces. It is essential to limit friction so as not to excessively increase temperature, which in practice must be maintained below 44 °C.

The rate of tapping or of insertion of the self-tapping screw must therefore be the lowest possible for screwing into the bone. This operation can therefore only be carried out manually.

The use of motorized tappers or screwdrivers does not allow easy control of the speed or consequently of the heat produced.

In conclusion, in the current state of the art, as a result of a combination of the aforesaid local effects, the damaged spongy bone tissue becomes replaced with soft cicatricial tissue, which by its nature is unable to ensure effective fixing to the screw.

II - General effects

As is well known, the trabecular spaces are not empty, nor is any part of the bone. The system which they form can be considered a closed hydraulic system containing a system of channels through which blood flows. Consequently the insertion of an additional volume must necessarily result in a reduction in the blood flow and an increase in the total volume of the system. Thus as in the known art the drilled hole is equal at most to the volume of the screw core, inserting the self-tapping screw or the tapper means that an additional volume is inserted into the bone tissue which is at least equal to the volume of the threads. This produces a significant increase in the internal pressure of the bone, which can easily exceed the breakage limit of the bone and cause fracture. Such fracture does not generally occur at the interface, where the aforesaid local phenomena occur, but starts from the external cortical bone, at the hole. Any excessive increase in the pressure within the system must therefore be avoided.

There is a second effect which produces a pressure increase within the bone. This is generated by the insertion of a self-tapping screw or of a tapper of known type. This is because from the very commencement of their insertion these close the hole in the bone, from which the blood should emerge. This blood is therefore pushed to the base of the hole to further increase the internal pressure of the bone, so that said fracture risk increases.

The object of the present invention is to overcome the aforesaid drawbacks of known bone screws and of their methods of application, by providing a screw device for fixing prostheses to bones, a method for applying the device, and the instrument for effecting the application, such as to result in spontaneous repair (by creeping substitution) of the lamellar bone tissue around the screw, the screw becoming thus securely and permanently fixed in the bone. To obtain healing by creeping substitution, a method of bone repair essentially identical to bone rearrangement, the quantity of blood coagulum present at the surface of the screw implant according to the present invention must be minimal. This is because blood coagulum converts into mature lamellar bone very slowly (6-12 months in man), by a self-limiting process. This latter characteristic means that ossification of the coagulum may not go to completion, and instead give rise to the formation of fibrous tissue unsuitable for supporting loads.

To enable creeping substitution to take place it is also essential that the vascular channels in the necrotic lamellar bone are not destroyed, and thus the pressure exerted during screwing must be a minimum.

It is therefore necessary to substantially eliminate the blood coagulum between the calcified bone and the implant by obtaining the maximum possible congruence or adhesion between the bone tissue and the relative parts of the screw, without any pressure being exerted which could irreparably damage the lamellar bone.

In particular, it is essential that the cavity formed in the bone has a degree of precision substantially higher than that currently obtainable in the known art, so as to reduce to a minimum the amount of bone tissue which has to reform. The screw must also have a shape which reduces the amount of bone tissue to be reformed to a minimum.

During healing, in order for the necrotic lamellar bone tissue transformation to take place by creeping substitution (which preserves the special mechanical characteristics of lamellar bone and takes place within 6-12 weeks), it is essential to prevent the aforesaid phenomena occurring. In particular any resorption of marginal bone or bone debris must be prevented. This ensures primary stability, which is essential. In this case, even during the healing period, during which for obvious reasons one tries not to load the screw, this latter is able to support those small loads which accidentally but almost inevitably tend to act on it, without any negative consequences arising.

Co-pending EP-A-0424734 discloses a screw device comprising a neck and a threaded shank, and characterised in that the threaded shank of the screw has a core of overall frusto-conical shape, the screw core being cylindrical and having a diameter equal to or just greater than the maximum diameter of the thread on the shank of the screw, and the thread being of two different types, namely a first thread of large pitch suitable for fixing into the trabecular bone tissue and extending along that part of the shank which is designed to make contact with said trabecular tissue, and a second thread, which can be of the self-tapping type, and intended to fix into that cortical part of the bone opposite the part into which the screw is inserted, said second thread having a number of starts which is a multiple of that of the first thread.

In contrast to a screw with a cylindrical core, a screw with a frusto-conical core, because of its particular geometrical shape and if associated with a corresponding suitable frusto-conical cavity of adequate precision, reduces the quantity of bone tissue to be reformed practically to zero, with maximum congruence obtained between the screw and cavity.

In addition because of the double type of thread, the described screw can fix effectively into both the trabecular bone tissue and into the cortical bone.

The fact that the screw neck, which when the screw is inserted lies only in the cortical bone on the screw insertion side, has a diameter greater or in the limit equal to that of the thread, means that the hole made in the bone must have a first portion, in practice equal only to said cortical bone, having a diameter at least equal to the neck diameter. Thus on inerting the self-tapping screw or tapper the cortical bone is not ruined.

If a fixing means or the like is present in contact with that cortical bone surface at which the screw is inserted to act as a counteracting means (for example in the case of screws for orthopedic use a prosthesis or a bone synthesis means resting against the surface), the screw according to the invention can comprise on the lateral surface of the screw neck a third thread of the same type as said second thread.

In this respect it has been found that the existence of said counteracting means in contact with the surfaces of said cortical bone prevents the lifting and destruction of the most outer part of the cortical bone, which could happen when said third self-tapping thread penetrates into the cortical bone if such a counteracting means were absent. A situation of this type occurs for example when a plate has to be applied for the synthesis of bone fractures.

In the particular stated case a fixing is therefore also obtained at the cortical bone via the screw neck, to obtain the best possible fixing for the screw in the bone.

To obtain the best result from the use of the screw device according to the invention a particular method of application must be followed for the device. This method enables a cavity to be obtained having dimensions substantially more precise than that obtainable by the known art and such as to reduce the quantity of bone tissue to be reformed to a minimum.

Specifically, the method for applying the screw device of the invention consists of:
forming a precision hole in the bone in the position in which said screw device is to be inserted, the hole comprising: a first more outer cylindrical portion to receive the screw neck, this first portion having a diameter equal to or preferably slightly less than that of the non-threaded neck of the screw, or slightly greater than the maximum core diameter of the neck if this latter is threaded; a second more inner frusto-conical portion of transverse dimensions equal to or preferably slightly less than those of the core of the first screw shank part carrying said first type of large-pitch thread; and a third portion extending along the remaining length of the screw shank, this third portion being relative to said second type of screw thread and of transverse dimensions slightly greater than those of the core of that shank part with said second type of thread;
tapping the said second portion of the hole to obtain in it a female thread suitable for receiving the said first screw thread;
if said second screw thread is not of self-tapping type, tapping said third portion to obtain in it a female thread suitable for receiving said second screw thread;
completely screwing said screw into the tapped hole.

This method of application results in maximum congruence between the screw and bone.

The said hole provided in the bone can also be a through hole if appropriate.

The present invention specifically relates to a cutter enabling to form said precision hole, by means of a precision boring method using said cutter and a reamer.

Specifically, the cutter according to the invention is of the kind cooled by sterile liquid which also performs the function of removing the bone shavings which form, and is characterised by having its cutting part in the shape of an inverted "wedding cake".

By this term, which immediately enables the shape of the cutter to be visualized, it is meant that the cutter consists of a number of coaxial cylindrical bodies rigid with each other, their diameter decreasing towards the tip of the cutter.

The manual reamer is of such form and dimensions as to enable the final hole to be obtained with the required precision, ready for tapping, the reamer having a relief angle suitable for cutting bone tissue.

Conveniently, the reamer comprises means for conveying isotonic liquids into the cavity formed in the bone, to facilitate the operation. The purpose of such liquids is to reduce bone necrosis.

The means for conveying nutrient liquids can simply consist of a coaxial channel passing through the entire reamer, in communication with a device for feeding isotonic liquids and with lateral apertures provided between the reamer cutting edges, to enable the isotonic liquid to make contact with the tissues concerned.

The method for forming said precision hole for the insertion of a screw device consists of:
forming with the inverted "wedding cake" cutter a cavity with steps having diameters less than or at most equal to those of the required precision hole;
then, by means of said reamer, manually reaming the thus formed stepped cavity to obtain the required precision hole ready for tapping.

It has been found that the best results are obtained when both the (unthreaded) neck of the screw and the core of the first shank part of the screw have diameters which are slightly greater by

a few microns than those of the relative hole. In this case the screw slightly compresses as it is screwed in, but without causing the damage previously described under point I(b). In this manner maximum congruence is obtained between the screw neck and thread on the one hand, and the bone tissue on the other, to also produce minimum bone damage.

It has also been found advantageous to screw the screw slightly further in once it has reached its final position in the cavity.

This provides maximum adherence between the screw frustum or core and the cavity.

To form the large-pitch female thread in the side walls of the second hole portion to receive the first type of screw thread, the tapper a co-pending european application is used, having a tapping thread with a maximum diameter not exceeding that of the screw neck, this tapping thread having the same number of starts and the same pitch as the first screw thread, and extending for the same length as said first screw thread, the end part of the tapper, of length substantially equal to that of the second screw thread, being free of tapping threads and having transverse dimensions not exceeding those of the corresponding third portion of the hole if said second screw thread is of the self-tapping type, whereas said end part of the tapper has a tapping thread with the same number of starts and the same pitch as the second screw thread if this second thread is not self-tapping; the tapper having at least one discharge means to allow escape of the organic liquids. In one embodiment of the tapper the discharge means can be a coaxial channel communicating with apertures which open between the tapper threads. In a modified embodiment of the tapper the discharge means are one or more longitudinal lateral grooves extending along the entire length of the tapper to interrupt all of its threads and partly involve the core of the tapper. The outer edges of each groove are conveniently rounded to reduce damage to the bone tissue to a minimum.

Preferably the directrices forming the frusto-conical core of the second screw thread are parallel, but internal, to the directrices forming the core of the first thread, so that a small annular step is present between the two surfaces.

When the screw has been inserted there is therefore an annular space between the core of the second thread and the corresponding side wall of the hole. This space acts as a compensation space which is at least partly filled by cortical bone bone tissue which is plastically deformed following introduction of the screw into the third hole portion if the screw if the second thread is self-tapping, or of the threaded end part of the tapper if the second screw thread is not self-tapping.

This compensates that thread volume which penetrates into the cortical bone, so that no dangerous pressure increase is created in the bone.

In the relative shank part of the second screw thread there can be provided at least one longitudinal groove having the double purpose of providing further compensation space for any other pressure increases which may arise, and of providing a region for collecting any bone shavings. Such pressure increases can be generated by fluid present under the tip of the screw, and which having no means of escape could undergo compression during screwing, with the stated consequent drawbacks.

Said vertical groove also acts as an anti-unscrewing device because new cortical bone tissue forms in it to prevent unscrewing.

Thus in cases in which the screw is to be removed after a certain time period this groove must not be provided.

For the first type of screw thread an annular compensation space as provided for the second self-tapping thread is not essential, because of the different nature of the bone tissue concerned, ie trabecular. As stated, the tapper for forming the female thread for receiving the first screw thread cuts and laterally displaces the solid part of the spongy bone tissue, which fills the available adjacent space.

As also stated, the purpose of the discharge means provided in the tapper for the liquids contained in the bone is to enable both the blood emerging from the surgical wound and that liquid fraction displaced by the formation of the female threads to escape. This enables local effects (which have already been mentioned) to be controlled to the desired degree and also inhibits the already mentioned negative general effects.

It has been stated that the discharge means can be grooves provided in the tapper. It should be noted that normal tappers for mechanical use also comprise longitudinal discharge grooves which interrupt the tapping threads and also involve their core.

These grooves have however a different purpose. In these, the edges of the longitudinal grooves must be properly sharp in order to cut the material in which the female thread is to be formed.

The purpose of these grooves is to allow collection and removal of the shavings formed by the action of the groove cutting edges against the hole wall.

In contrast in the present case, as the formation of shavings during the making of the large-pitch female thread is to be prevented and the said trabecular tissue compression is to be limited, the edges of the longitudinal groove are rounded. In tapping with the tapper according to the invention

there is therefore no removal of bone tissue but only the removal of an equivalent volume of organic fluids. The trabecular tissue is therefore only cut and dislodged by the tapper threads without any pressure increase occurring. The spongy bone tissue therefore only undergoes displacement of the said solid and liquid, which does not prejudice the crawling substitution reparative process of the new lamellar bone tissue in the surrounding regions damaged by the tapping operation.

In penetrating the spongy bone tissue the large-pitch thread of the tapper must damage this tissue as little as possible. In particular, the crest of the first turn of the tapping thread must be pointed to allow optimum tissue cutting action. A convenient cross-sectional shape for the other turns of the tapper thread could therefore be trapezoidal without sharp edges, this being easily obtained mechanically. The first thread of the screw can also have threads of trapezoidal cross-section. This shape enables external loads perpendicular to the tapper axis to be absorbed without any cutting action occurring, and which would in contrast occur with pointed crests.

For the second screw thread involving the cortical bone, said problems are not so stringent, so that the cross-section of the relative thread can conveniently be triangular but with a rounded crest to avoid as much as possible any cutting action or dangerous load concentration should a force with a component perpendicular to the screw axis act on the screw.

The same applies to the tapping thread on the end of the tapper if the second screw thread is not self-tapping.

A description of two embodiments of the screw of the hole for the screw, of the cutter and reamer for obtaining the required hole precision, and of the corresponding tapper, follows.

Reference is made in this description to the accompanying drawings, in which:

Figure 1 is a side view of a screw according to EP-A-0424734 particularly suitable for odontology, of the type comprising a self-tapping second thread;

Figure 2 is an axial longitudinal section through the hole for receiving the screw of Figure 1, before the hole has been tapped;

Figure 3 is a side view of a first embodiment of a tapper according to the above-mentioned copending application for tapping the hole of Figure 2, the tapper having an unthreaded end part;

Figure 4 is a cross-section therethrough on the line IV-IV of Figure 3;

Figure 5 is a cross-section therethrough on the line V-V of Figure 4;

Figure 6 is a side view of a second embodiment of the tapper;

Figure 7 is a cross-section therethrough on the line VII-VII of Figure 6;

Figure 8 is a side view of a screw particularly suitable for orthopedics;

Figure 9 is a side view of the inverted "wedding cake" cutter according to the present invention;

Figure 10 is a cross-section therethrough on the line X-X of Figure 9;

Figure 11 is a side view of a reamer; and

Figure 12 is an enlarged bottom view thereof on the line XII-XII of Figure 11.

The devices shown in Figs. 1,3,4,5,6,7,8,11 and 12 and the corresponding description do not fall within the scope of the claim, but are useful for understanding the invention.

From figure 1 it can be seen that the screw 10 consists of two distinct basic parts, namely a cylindrical upper neck 12 and a threaded shank 14.

The threaded shank 14 is coaxial to the neck 12 and integral with it, and connects to the neck 12 via a short frusto-conical connecting section 20. This latter can however be absent, the frusto-conical surface of the screw core then extending directly from the periphery of the base of the cylindrical neck 12.

The upper portion of the cylindrical neck 12 is intended to project beyond the bone, whereas the rest of the neck 12 is surrounded by the cortical bone with the screw inserted.

A cylindrical rather than frusto-conical shape has been chosen for the screw neck 12, so that when under load the neck does not transmit axial loads to the adjacent cortical bone, but is able to transmit to the cortical bone any loads perpendicular to the axis of the screw 10 via its lateral surface 13 which is surrounded by it when the screw has been applied.

In the free upper surface of the cylindrical neck 12 there is an axial prismatic cavity 16 (shown by dashed lines in Figure 1) to receive a suitable tool (Allen key or the like), not shown on the drawings, to enable the screw 10 to be manually screwed into the bone and to allow the screw to subsequently receive dental prostheses. These latter can for example comprise a pin-stump for prosthetic application by the method of Dr. Vrespa (Cenacolo Gruppo Italiano Studi Implantari, Bologna, November 187; Atti Congresso Internazionale GISI, May 1988). At the base of the prismatic cavity 16 there is a threaded or non-threaded axial hole 18 (shown dashed in Figure 1), for fixing to the screw a known healing plug (not shown) or whatever else may be required.

The presence of the two cavities 16 and 18 allows a mesostructure to be applied by screwing or cementing depending on the choice made and the requirements of the particular case.

The shank 14 comprises two coaxially aligned parts 22 and 24 forming a single piece and having two different types of thread.

Specifically, a first cylindrical single-start thread 26 of large pitch is provided on the upper part 22 of the shank 14. The first thread 26 is suitable for fixing into the spongy bone tissue, the relative thread having a trapezoidal cross-section with rounded edges. In the case shown in Figure 1 the helical crest of the turns of the first thread 26 lie on a cylindrical surface having a diameter equal to the diameter of the screw neck 12, the outer diameter of the first thread thus being constant throughout its entire length. Consequently the height of the thread increases from the top downwards. In the case in which the frusto-conical connection 20 is not provided and if said surface is still cylindrical, the thread height starts from zero at its highest point.

Returning to the embodiment shown in Figure 1, on the lower part 24 of the shank 14 there is a second thread 28 with three starts, each with the same pitch as the first thread 26. The second thread 28 is self-tapping. Tie thread turns are of triangular cross-section with a rounded crest. The thread height is constant along the entire thread. The thread crests lie on a frusto-conical surface parallel to that of the core 32 of the second thread. Because it has three starts this latter acts from the fixing viewpoint substantially as a thread having a pitch equal to 1/3 of the effective pitch. This makes the thread suitable for fixing into the cortical bone, and in this specific case into the cortical bone opposite the point of introduction of the screw.

The lengths of the various component parts of the screw are obviously such that when the screw is inserted into the bone the screw neck 12 lies mainly within the cortical bone on the side from which the screw is inserted, the intermediate part 22 of the shank 14 comprising the first thread 26 lies within the trabecular bone tissue, and the end part 24 of the shank 14 which contains the the second thread 28 lies mainly within the opposite cortical bone. In practice the screw neck 12 and the second thread 28 may lie slightly within the trabecular bone tissue region as it is difficult to previously know the exact thickness of the cortical bone.

As can be seen from Figure 1, the part 24 of the shank 14 comprises a vertical groove 30 which interrupts the thread 28 and lies partly within the core 32.

The purpose of the groove 30, which can however also be absent, has already been stated.

From Figure 1 it can be seen that both the core 34 of the upper part 22 of the shank 14 and the core 32 of the lower part 24 are frusto-conical (the relative lateral surfaces being parallel), but with a small step 36 between them.

The method of application of the screw of Figure 1 and the tools for the purpose will now be briefly described, with particular reference to the making of the hole into which said screw is to be inserted.

The first operation consists of drilling in the bone a precision hole 40 shaped as in Figure 2.

To do this the so-called inverted "wedding cake" cutters of the present invention are used. One of these cutters is shown in Figures 9 and 10. The cutter 100 consists of a shank 102 of conventional shape, a spacer portion or extension 104, and a cutter portion 106. The shank 102 is connected into the already mentioned quick-connection mechanism of the drill. The purpose of the extension 104, which is of suitable length, is merely to enable the cutter portion 106 to reach the required point, for example when a hole is to be drilled between two teeth adjacent to a missing tooth. If this requirement does not arise then the extension 104 can be absent.

As can be seen from Figures 9 and 10, the actual cutter part 106 consists substantially of three coaxial cutting bodies 103, 105 and 107, which are rigid with each other and arranged to produce three hole portions of circular cross-section and having a diameter which respectively decreases towards the interior of the bone.

The cutter 100 terminates within a tip 109 of conventional type and comprises an axial channel 108 communicating with the apertures 110, 112 and 114 visible in Figure 9. The channel 108 enables the iosotonic cooling liquids to be discharged during bone drilling.

Preferably a circular line 111 is engraved or otherwise reproduced on the cutting body 103 to visibly indicate the exact level to which the cutter 100 must penetrate into the bone. When the line 111 has reached the level of the bone surface it is therefore certain that the cutter has reached the required depth.

When a stepped hole of the stated type has been obtained in the bone by one advancement of the cutter 100, the hole is enlarged by means of a manual reamer of the present invention, to obtain a frusto-conical hole of the required precision (Figure 2). A reamer of this type is shown in Figures 11 and 12.

As already stated, to obtain the desired results the reamer 140 must necessarily be operated manually.

The reamer 140 comprises a shank part 142 of hexagonal cross-section to be engaged by a suitable tool for the manual reaming of said stepped cavity, plus a reamer part 144, which has a relief angle suitable for cutting the bone tissue. The reamer part 144 is itself divided into two sections,

namely a first section 143 for producing a cylindrical hole portion and a second section 145 for producing a frusto-conical hole portion.

In the specific case of Figure 11, the first section 143 connects to the second section 145 via a frusto-conical connection 141.

As stated, the reamer 140 also comprises an axial channel 146 which passes completely through it and communicates with lateral apertures 148 provided between the cutting edges. In the specific case of Figures 11 and 12 the lateral apertures 148 are four in number, two in the groove 147 and two in the opposite groove 149.

The isotonic liquid is fed through the channel 146 to reduce bone necrosis.

When said reaming is complete a hole is obtained of the type shown in Figure 2. This hole can also be a through hole or can stop at a certain distance D from the outer surface of the opposite cortical bone.

The first portion 42 of the hole 40 is cylindrical and has a diameter less by a few microns than the diameter of the cylindrical neck 12 (Figure 1) of the screw. The height of this first portion 42 is equal to or slightly greater than the thickness of the cortical bone 50, and in any event sufficient for receiving that part of the neck 12 of the screw 10 which is intended to enter the bone.

The hole 40 proceeds inwards via a short frusto-conical connection portion 44, corresponding to the frusto-conical section 141 of the reamer 140 (Figure 11) and to the frusto-conical portion of the screw 10 (Figure 1). It connects the first section 42 to the second frusto-conical section 46. This latter has diameters less by a few microns than the diameters of the core 34 of the first part 22 of the shank 14 of the screw 10.

The hole 40 terminates with a third portion 48, which is nothing other than the prolongation into the opposite cortical bone 54 of the directrices of the second hole portion 46.

In the aforesaid case in which the screw 10 (Figure 1) does not have the frusto-conical connection portion 20, the hole will also not have said connection portion 44, the second frusto-conical portion of the hole then extending directly from the base perimeter of the first cylindrical portion 42 of the hole.

Likewise, the reamer 140 (Figure 11) will also not have the frusto-conical connecting section 141.

Conveniently, the third portion 48 of the hole 40 is slightly longer (for example by 1 mm) than the corresponding lower part 24 of the shank 14 of the screw 10 (Figure 1). The purpose of this is to prevent destruction of the female thread in the bone by any over-tightening of the screw, which could occur if the two said lengths are equal. In this respect any further advancement of the screw is prevented by the base 41 of the hole 40.

The slightly longer length of the hole 40 results in adhesion between the comical cavity and the core of the screw. This also compensates for tolerances.

In the specific case of dental screws, the upper cortical bone 50 becomes covered by the gingive 55 (see Figure 2), so that this latter has to be perforated by conventional tools before proceeding with the drilling. The hole will therefore also comprise an upper gingival portion 49.

When the hole 40 has been made, a female thread (not shown in the figures) is formed in the side wall of its second portion 46 to receive the first thread 26 of the shank 14 of the screw 10. This is obtained using the tapper 60 shown in Figure 3. To increase adhesion between the screw 10 and the new bone tissue which has to reform about the screw, the first part 22 of the shank 14 and the respective part of the neck 12 are normally coated with titanium in known manner by plasma spray treatment, which slightly increases its dimensions.

Consequently the dimensions of the tapping thread 62 and of the core 64 of the part 68 of the tapper 60 must be proportionally increased with respect to the dimensions of the bare screw, as must the dimensions of the parts 46, 42 and 44 of the hole 40.

The lower frusto-conical part 66 of the tapper 60 is unthreaded, it has the same length as the corresponding second part 24 of the shank 14 of the screw 10, and at most has the same transverse dimensions as the core 32 of said part 24 of the screw.

The tapper also comprises an upper part 70 substantially analogous to the neck 12 of the screw 10, the part 70 upperly comprising a projection 72 having a polygonal cross-section for engagement by a suitable tool (not shown) to enable the tapper 60 to be inserted.

This latter comprises a longitudinal groove 74 of substantially trapezoidal cross-section extending along the entire tapper (see also Figures 4 and 5), its purpose having already been stated. It will be noted that the edges 73 of the groove 74 are rounded, for the previously stated reasons.

Figures 6 and 7 show a modification of the tapper according to the invention which has proved particularly convenient. The tapper 160 is particularly suitable for tapping holes for receiving screws without the connection portion 20, so that the relative precision hole will be without the portion 44. The only true difference compared with the tapper 60 of Figures 3 to 5 is that instead of the longitudinal groove 74 (Figure 3) for discharging the organic liquids there is a coaxial circular channel 174 which passes longitudinally through the entire tapper 160.

This channel communicates with the outside not only at its two ends but also via the series of apertures 176 provided in the core part 164, each aperture opening between two successive turns of the tapping thread 162.

The dimensions of the tapper 160 of Figures 6 and 7 do not correspond to those of the screw of Figure 1, as it relates to a shorter screw without the connection portion 20, as stated. When the hole 40 has been tapped, the screw 10 is screwed into it, its second self-tapping thread 24 penetrating securely into the opposite cortical bone 54 (Figure 3).

After a suitable time period, required for crawling substitution in the cortical bone and the formation of primary bone in the spongy part, new bone tissue reforms in contact with the screw to ensure its stability with time.

Figure 8 shows a modification of the screw according to the invention which is particularly suitable for orthopedics, for example for fixing a plate to a femur. The screw 80 is shown in Figure 8 already inserted into the bone. It differs from the screw 10 of Figure 1 only by the presence of a third self-tapping thread 23 provided on the lateral surface of the screw neck 112.

The third thread 23 can be provided only if a counteracting element 82 is present, such as a plate resting on the surface of the femur cortical bone 50. The plate 82 prevents lifting and destruction of the surface layer of the cortical bone 50 when the self-tapping thread 23 grips the cortical bone 50.

The third thread 23 could also be not of self-tapping type. In this case, in the first portion 42 of the hole 40 a relative female thread is formed by a suitable tapper (not shown). The relative hole portion corresponding to the neck 112 of the screw 80 is consequently given a slightly larger diameter than the relative core 132 of the thread 23 of the screw 80, but less than the outer diameter of the thread 23, for the same reasons as stated for the hole corresponding to the second thread 28.

As will be immediately apparent, the orthopedics screw 80 results in optimum stable fixing to the bone.

Claims

1. A bone tissue cutter (100), of the type cooled by sterile liquid which also serves the purpose of removing the bone shavings which form, characterised in that the cutting part (106) of the cutter (100) comprises a number of coaxial cylindrical bodies rigid with each other, their diameter decreasing towards the tip of the cutter.

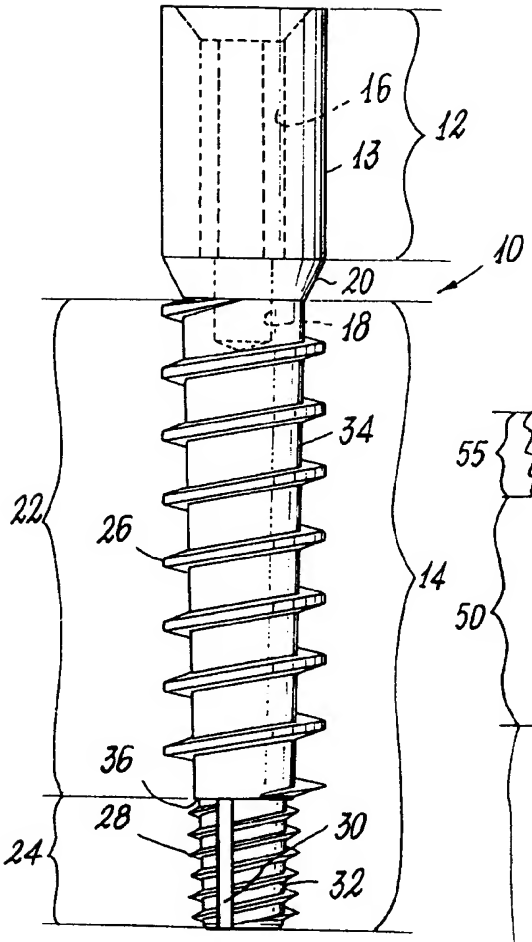
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Fig. 1

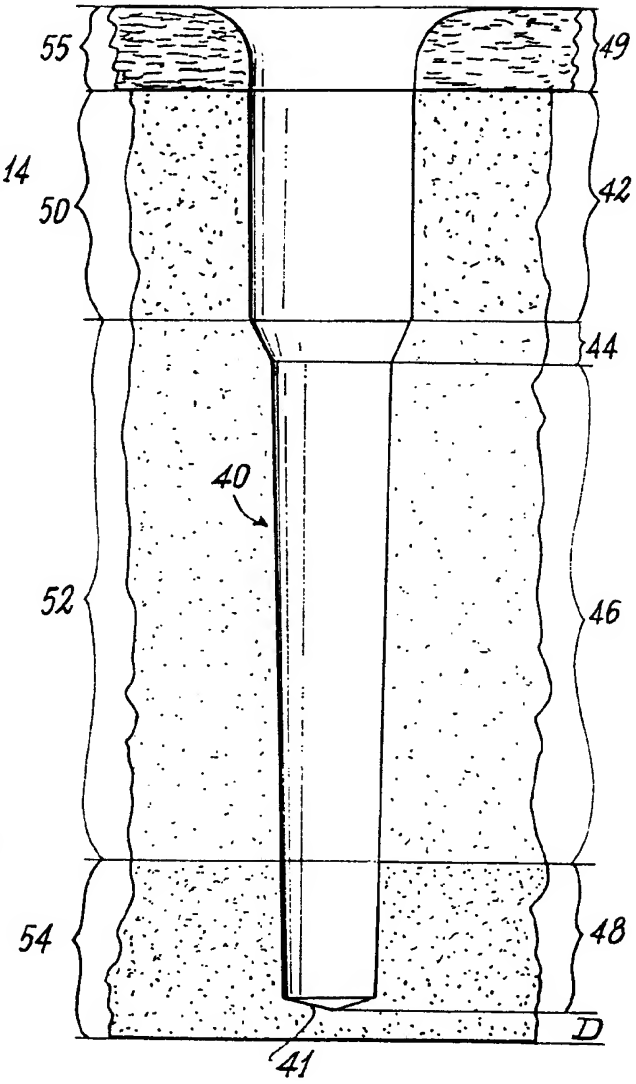
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Fig. 2

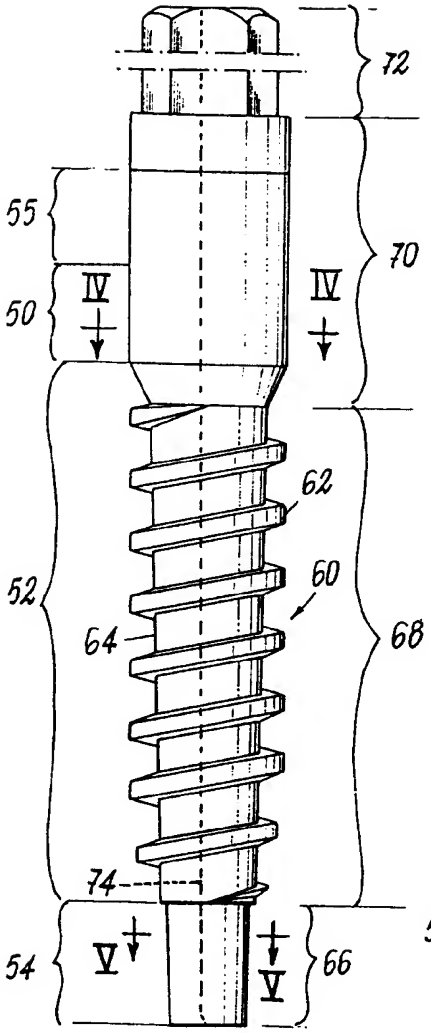


Fig. 3

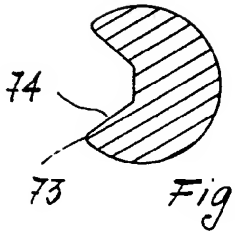


Fig. 4

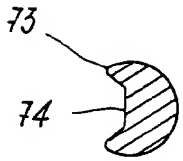


Fig. 5

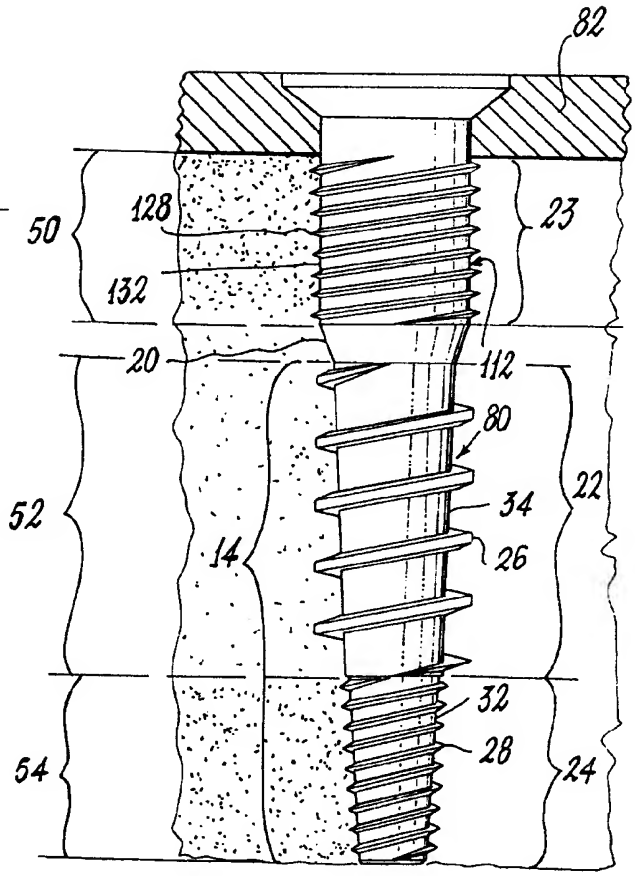
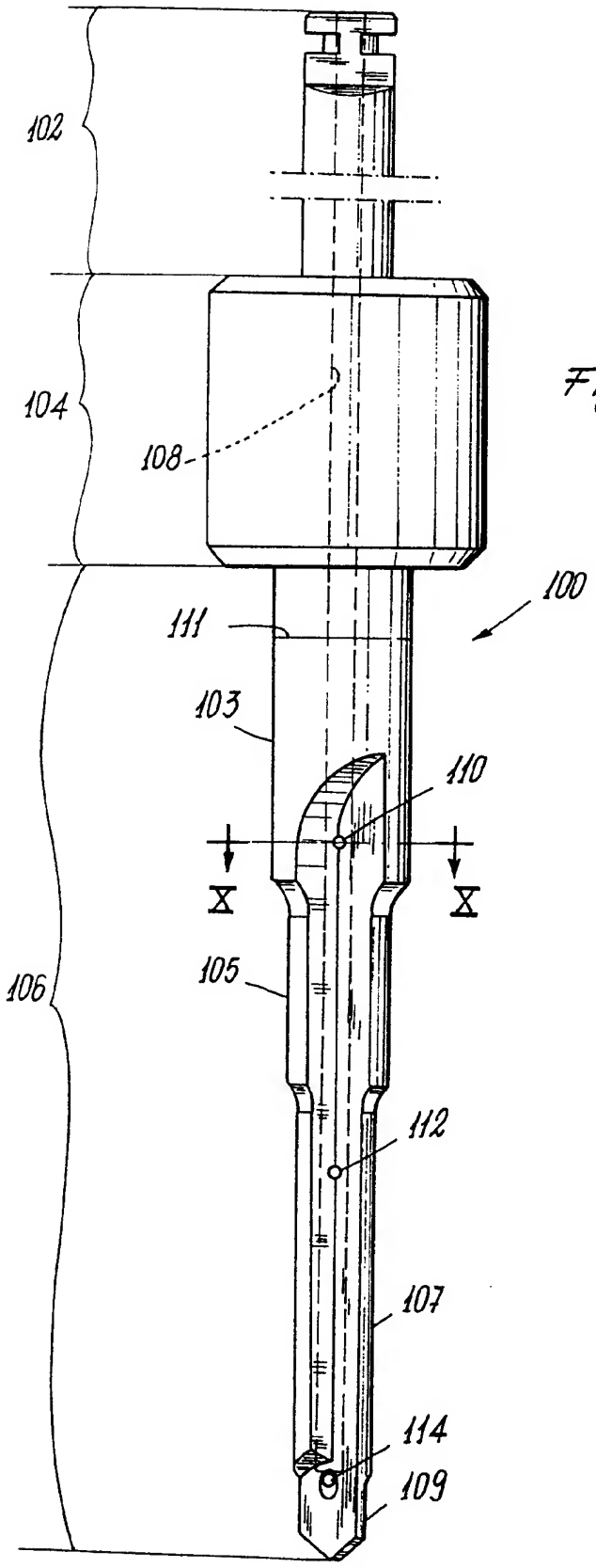


Fig. 8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109

Fig. 9

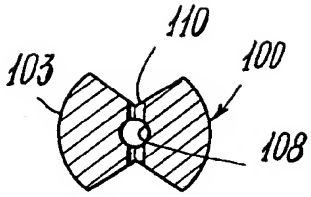
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Fig. 10

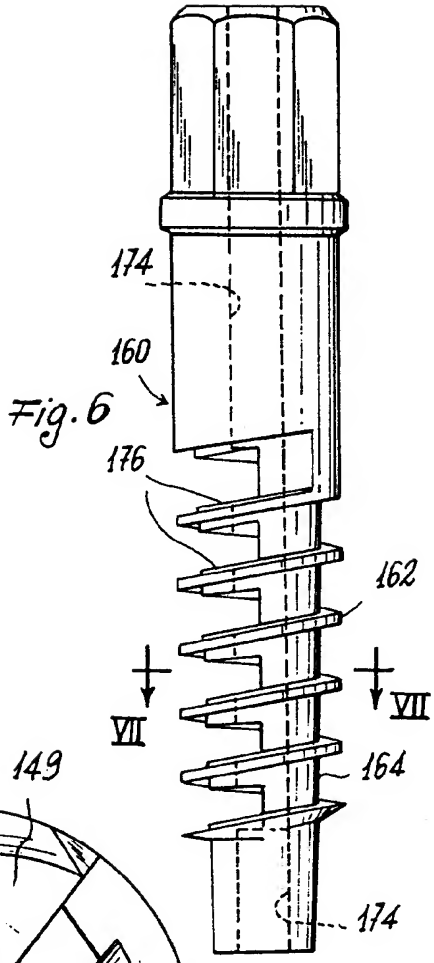


Fig. 6

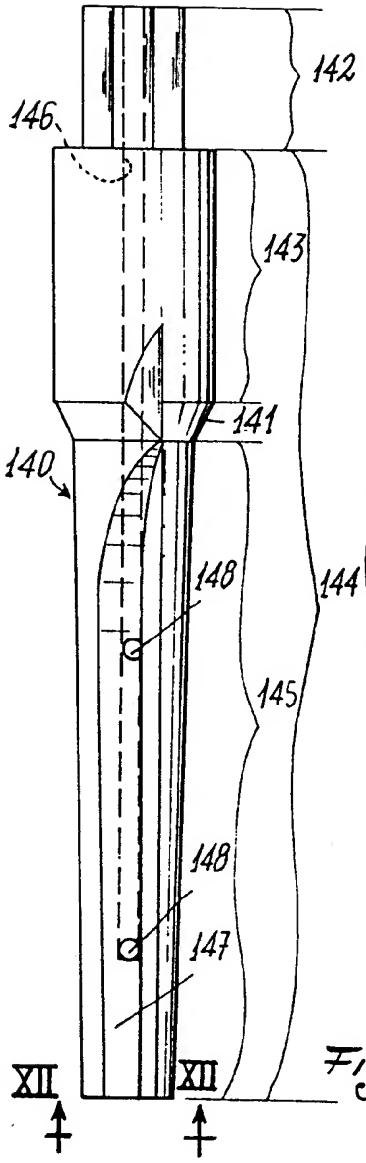


Fig. 11

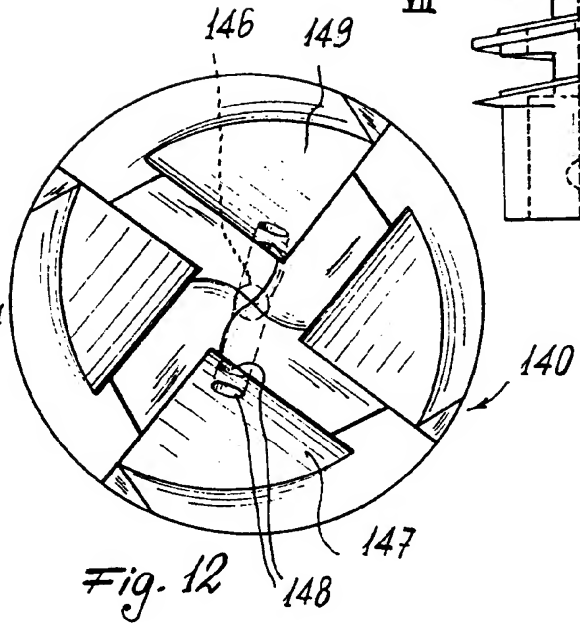
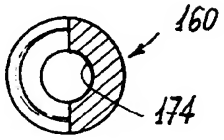


Fig. 12

Fig. 7



European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 93102624.9

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US - A - 4 362 161 (H.G. REIMELS et al.) * Fig. 1-3; column 4, lines 26-63; column 5, lines 25-68; column 7, lines 19-26 * --	1	A 61 B 17/16
A	DE - A - 3 433 570 (A. LEITER) * Fig. 1,2; abstract; page 10, line 19 - page 11, line 4 * ----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 61 B
A 61 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	07-05-1993	LUDWIG

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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